Shoreline Analysis Report for Shorelines in Grays Harbor County

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The Watershed Company

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Coast & Harbor Engineering

GRAYS HARBOR COUNTY

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SHORELINE ANALYSIS REPORT

for Shorelines in Grays Harbor County

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READERS GUIDE

The main purpose of this report is to provide information about shorelines in Grays Harbor County.

As the County works to update its Shoreline Master Program, the broad-scale overview of shoreline conditions provided in this report should help the County to make decisions about how to manage its shorelines in the years to come. This report should help provide the County with answers to questions such as:

- What kind of land uses occur along shorelines? What kind of land uses might be expected in the future?
- Where can County residents and visitors access shorelines? Are more locations for public access needed?
- What issues threaten the environmental quality of shorelines in the County? What actions can be taken to improve the quality of shorelines?

It is also important to mention what this report is not intended to do. This report is not intended to provide an assessment of shoreline conditions on specific properties. It is also not intended to be used in the future to provide a specific numerical figure of shoreline improvements or losses.

A brief description of the organization and content of the report is provided below.

- **Section 1** provides more detail about the purpose of this report and discusses the basics of how the County manages its shorelines under the Shoreline Management Act.
- **Section 2** reviews what laws and agencies are particularly important in shoreline areas.
- **Section 3** takes a big-picture look at County shorelines. Topics include climate, geology, topography, drainage patterns, key species and habitats, and major land use changes that have affected, or in some cases, have a potential to affect, shoreline functions in the County.
- **Section 4** (Shoreline Inventory) summarizes available data mapped in the Inventory Mapfolio (Appendix B). The shoreline inventory synthesizes available data and identifies data assumptions, limitations, and data gaps.
- **Section 5 (**Characterization of Ecological Functions) describes characteristics of shoreline reaches, with specific attention to the extent of existing human

disturbance. This section also includes brief descriptions of voluntary restoration opportunities for the shorelines of Grays Harbor County.

- **Section 6 (**Land Use Analysis) summarizes current land use and planned future land use.
- **Section 7** makes recommendations for shoreline management based on the contents of the previous chapters. This section includes a comparison of existing Shoreline Environment Designations and those recommended by the Washington Department of Ecology. The results of this report may prove useful in reviewing the consistency of existing Shoreline Environment Designations with existing conditions and uses, and establishing new or revised Shoreline Environment Designations, where appropriate.

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1 INTRODUCTION

1.1 Background and Purpose

Grays Harbor County (County) obtained a grant from the Washington Department of Ecology (Ecology) in 2013 to complete a comprehensive update of its Shoreline Master Program (SMP). One of the first steps of the update process is to inventory and characterize the County's shorelines as defined by the State of Washington (State) Shoreline Management Act (SMA) (RCW 90.58). This analysis was conducted in accordance with the Shoreline Master Program Guidelines (Guidelines, Chapter 173-26 WAC) and project Scope of Work promulgated by Ecology, and includes all unincorporated areas within the County. Under these Guidelines, the County must identify and assemble the most current, applicable, accurate and complete scientific and technical information available.

This Shoreline Analysis Report describes existing conditions and characterizes ecological functions in the shoreline jurisdiction. This assessment of current conditions will serve as the baseline against which the impacts of future development actions in shoreline jurisdiction will be measured. The Guidelines require that the County demonstrates that its updated SMP yields "no net loss" in shoreline ecological functions relative to the baseline (current condition) due to its implementation. The no net loss requirement is a new standard in the Guidelines that is intended to be used by local jurisdictions to test whether the updated SMP will in fact accomplish the SMA objective of protecting ecological functions.

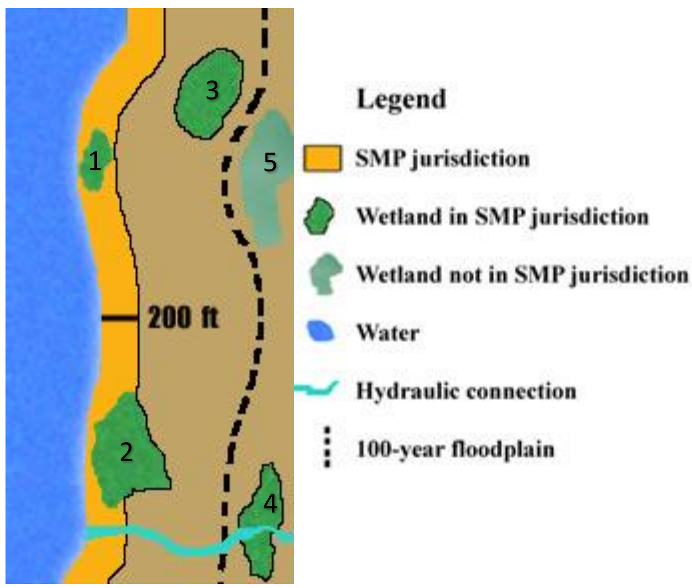
1.2 Shoreline Jurisdiction

As defined by the Shoreline Management Act of 1971, shorelines include certain waters of the State plus their associated "shorelands." At a minimum, the waterbodies designated as Shorelines of the State are streams whose mean annual flow is 20 cubic feet per second (cfs) or greater, lakes whose area is greater than 20 acres, and all marine waters extending three miles offshore. Shorelands are defined as:

> "those lands extending landward for 200 feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and

contiguous floodplain areas landward 200 feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter… Any county or city may determine that portion of a one-hundred-year-floodplain to be included in its master program as long as such portion includes, as a minimum, the floodway and the adjacent land extending landward two hundred feet therefrom… Any city or county may also include in its master program land necessary for buffers for critical areas (RCW 90.58.030).”

Figure 1-1 provides a diagram conveying the extent of shoreline jurisdiction.



1. Shoreline-associated wetland located entirely within 200 feet from the OHWM
2. Shoreline-associated wetland located partially within 200 feet from the OHWM
3. Shoreline-associated wetland located beyond 200 feet from the OHWM, but within the 100-year floodplain
4. Shoreline-associated wetland that is beyond 200 feet from the OHWM and outside of the 100-year floodplain, but that is hydrologically connected a shoreline waterbody
5. Wetland that is not considered part of shoreline jurisdiction because it is beyond 200 feet from the OHWM, outside of the 100-year floodplain, and not hydrologically connected

Figure 1-1. Diagram showing areas within shoreline jurisdiction (from Ecology).

The ordinary high water mark (OHWM) is:

“that mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and

> usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that condition exists on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with permits issued by a local government or the department: PROVIDED, That in any area where the ordinary high water mark cannot be found, the ordinary high water mark adjoining salt water shall be the line of mean higher high tide and the ordinary high water mark adjoining fresh water shall be the line of mean high water" (RCW 90.58.030(2)(b)).

A detailed description of the methods used to depict shoreline jurisdiction is included in Appendix A.

The Shoreline Management Act (SMA) sets specific preferences for uses and calls for a higher level of effort in implementing its objectives along designated Shorelines of Statewide Significance. All streams and rivers which have mean annual flow of 1,000 cfs or greater are considered Shorelines of Statewide Significance, along with their associated uplands. Within Grays Harbor County, the following streams and rivers are included.

- Chehalis River
- Humptulips River (mainstem)
- Quinault River
- Satsop River (East Fork and mainstem)
- North River (southernmost portion within the County, downstream from the mouth of Lower Salmon Creek)
- Wynoochee River (downstream from the mouth of Carter Creek) and
- Queets River (a small portion in the northwestern corner of the County)

All areas seaward of the OHWM along the Pacific Ocean coastline, including harbors, bays, estuaries, and inlets, and all shorelands associated with these waters are also considered Shorelines of Statewide Significance.

Lakes greater than 1,000 acres are considered Shorelines of Statewide Significance. Two lakes within unincorporated Grays Harbor County meet this criterion (Lake Quinault and Wynoochee Lake).

1.3 Study Area

The study area for this report includes all unincorporated land within the County's proposed shoreline jurisdiction. Further, the study area includes relevant discussion of the contributing watersheds.

Grays Harbor County encompasses 2,224 square miles. The County is bordered to the south by Pacific County, to the southeast by Lewis and Thurston Counties, to the east by Mason County, to the north by Jefferson County, and to the west by the Pacific Ocean. The County is predominantly rural in nature, and most of the land area is unincorporated areas. Incorporated areas of the County include the Cities of Aberdeen, Cosmopolis, Elma, Hoquiam, McCleary, Montesano, Oakville, Ocean Shores, and Westport. Grays Harbor County is home to a large portion of the Quinault Indian Nation (QIN) and about two-thirds of the Confederated Tribes of the Chehalis Reservation.

Federal lands make up 17 percent of the total shoreland area. Federal lands occur in Olympic National Forest (ONF), Olympic National Park (ONP), Grays Harbor National Wildlife Refuge, Copalis National Wildlife Refuge, and Colonel Bob Wilderness. Federal lands on which shoreline waterbodies lie are included in this report, but discussion of these lands is limited because the future SMP will only pertain to actions undertaken by non-federal parties on those lands.

State-owned lands make up 12 percent of the total shoreland area. The Washington Department of Natural Resources (WDNR) owns approximately half of all State-owned shorelands. Other agencies that own shorelands in the County include the Washington State Parks and Recreation Commission (WSPRC), the Washington Department of Fish and Wildlife (WDFW), and the Washington State Department of Transportation (WSDOT).

Tribal lands make up 15 percent of the total shoreland area. Tribal lands include the Quinault Indian Reservation (QIR) and the Chehalis Indian Reservation. Similar to federal lands, tribal lands are included in this report, but discussion of these areas is limited because tribal laws will apply to tribally owned and trust lands within the reservations.

According to the Washington State Office of Financial Management's most recent population estimate (2013), Grays Harbor County's population is 73,200 people. Of that, the unincorporated areas have a population of 28,615. Most development is concentrated near the County's incorporated areas and outer coastal communities. Historically, the County's economy was resource-based and included forestry and sale of wood products, fishing, aquaculture, and agriculture. According to the Washington Office of Financial Management, in 2013, resource-based employment accounted for only 3.3 percent of the County's employment;

however, these numbers may not account for the indirect importance of these sectors to other industries (e.g., manufacturing, warehousing, wholesale/retail trade), which together make up a much larger proportion of the regional economy. Tourism associated with charter fishing, ocean beaches, and the Quinault Beach Resort and Casino are also important contributors to the County's economy.

2 SUMMARY OF CURRENT REGULATORY FRAMEWORK

2.1 Shoreline Management Act

The Shoreline Management Act of 1971 promoted planning along shorelines and coordination among governments. The legislative findings and policy intent of the SMA states:

> "There is, therefore, a clear and urgent demand for a planned, rational, and concerted effort, jointly performed by federal, State, and local governments, to prevent the inherent harm in an uncoordinated and piecemeal development of the State's shorelines (RCW 90.58.020)."

While protecting shoreline resources by regulating development, the SMA is also intended to provide balance by encouraging water-dependent or water-oriented uses while conserving or enhancing shoreline ecological functions and values. SMPs must be based on State guidelines, but should be tailored to the specific conditions and needs of the local community.

2.2 Grays Harbor County

2.2.1 Existing SMP

Grays Harbor County adopted its first Shoreline Master Program on June 3, 1974. From that time until 1991, the SMP was amended eleven times, according to Ecology records. However, all of the amendments were limited in their scope. For example, the SMP was amended in 1987 to revise the policies and regulations for river bar gravel mining. Since 1991, there have been no Ecology-approved amendments to the Grays Harbor SMP. Therefore, the current effort to update the SMP represents the first time that the County's original SMP will be comprehensively reviewed and updated.

The eight incorporated cities in the County with Shorelines of the State are in the process of their own individual SMP updates. These cities include Westport, Ocean Shores, Montesano, Aberdeen, Hoquiam, Cosmopolis, Elma, and McCleary.

The current Shoreline Master Program designations for Grays Harbor County are briefly described below.

- **Urban:** The Urban Environment is intended for the most intensive human use of the shoreline. An Urban designation is assigned to a strip of aquatic area in Grays Harbor along the existing dredged channel.
- **Rural:** The Rural Environment is intended for shoreline uses or activities, but at a lower density than the Urban Environment. These include areas served by septic tanks and areas where soil limitations require a lower density of development.
- **Conservancy:** The Conservancy Environment is intended to protect lands, wetlands, and water of economic, recreational, and natural value. Shorelines within the boundaries of the National Forest are designated conservancy environments.
- **Natural:** The Natural Environment is intended for areas that have extreme importance for the maintenance of natural systems, and for which any change in the land, vegetation, or water would have significant adverse impact on the system. The Natural Environment includes upper intertidal marshes in the North and South Bays of Grays Harbor.
- **Ocean Beaches:** "The Ocean Beach Environment is intended to preserve the natural systems and amenities while providing for development of accommodations and services related to and necessary for support of human use of the beach areas." The Ocean Beach designation includes all Pacific Ocean beaches from a point three miles at sea to a point 200 feet east of either marram grass vegetation or the first line of vegetation on the beaches. Within the Ocean Beach designation, a dune protection zone is further identified as occurring between the line of marram grass vegetation on the west and a line 200 feet east of the line of marram grass vegetation.

Shoreline uses, developments, and activities are also subject to the County's Comprehensive Plan, County Code, and various other provisions of County, State and federal laws.

2.2.2 Grays Harbor Estuary Management Plan (GHEMP)

The GHEMP was developed through a multi-agency effort, involving local, State, and federal agency representatives, to develop unified estuary-wide guidelines that balance ecological protection and various demands for economic development. The GHEMP provides guidance for appropriate allowed and prohibited uses for specific shoreline reaches. Although the GHEMP itself is not a regulatory document, it is referenced in the County's current SMP. Upon adoption in 1986, participating State and federal agencies also agreed to use the GHEMP in their planning and permitting. The County first integrated the GHEMP into its SMP in 1988. The GHEMP was intended to be reviewed and amended through an annual and five- year review process. However, the last amendment to the GHEMP occurred in 1991.

2.2.3 Critical Areas

Grays Harbor County plans under the Planning Enabling Act (RCW 36.70). The County does not fully plan under the Growth Management Act (RCW 36.70A). Accordingly, the County's comprehensive plan was developed under the requirements of the former statute, not the latter. However, per GMA requirements for all local jurisdictions, the County is required to designate and protect critical areas and designate natural resource lands.

County regulations applicable to critical areas and natural resources were updated in 2012 to be consistent with Growth Management Act requirements and best available science. In those regulations, the County specified general stream/river buffers and wetland buffers as summarized in Table 2-1. The County's stream and wetland buffers and development standards are generally consistent with WDFW and Ecology guidance, respectively (Knutson and Naef 1997, Granger et al. 2005). In addition to standard buffers for wetlands and streams, the critical areas regulations apply specific standards to the shorelines of Lake Quinault. These standards require a critical protection area special study for any proposed development within 200 feet of the OHWM of Lake Quinault, and they require retention of all trees within that area. The permitting authority will determine buffers on Lake Quinault on a case-by-case basis in consultation with the QIN.

The County's geological hazard area regulations apply to areas susceptible to erosion hazards, landslide hazards, seismic hazards, tsunami hazards, and other geologic events. Proposed developments within 200 feet of a geologic hazard area require a study to assess whether the proposed development would increase the hazard risk. Only those projects that will not increase hazard risk may be permitted.

County regulations for frequently flooded areas prohibit fill, new construction, or substantial improvements that would increase flood levels during the base flood discharge. These standards help ensure that floodways will maintain their functions in storing and transporting water, as well as their habitat functions. Standards applicable to the floodplain and coastal flood zones are primarily focused on minimizing risks to structures and safety.

Table 2-1 Grays Harbor County Critical Area Buffer Regulations Summary

Critical Area	Category	Standard Buffer*
Wetlands	Cat. I	75-225**
	Bogs	190
	Estuarine	150
	Coastal Lagoons	150
	Natural Heritage Wetlands	190
	Cat. II	75-225*
	Interdunal Wetlands	110
	Cat. III	60-110*
	Cat. IV	40
	* Use of the standard buffer requires implementation of specified minimization measures (e.g., lighting, noise, stormwater discharge, long-term protection measures)	
	** Range is based on a sliding scale determined by habitat scores over 20	
	Buffers may be averaged provided that they are no less than 75% of standard buffer in any location	
Streams/ Lakes	Type S	150
	Type F	150
	Type Np	60
	Type Ns	50
	Buffers may be averaged provided that they are no less than 75% of standard buffer in any location	
	Buffers may be reduced by up to 25 percent as compensation for riparian enhancement	

2.3 State Agencies and Regulations

Aside from the SMA, State regulations most pertinent to development in the County's shorelines include the State Hydraulic Code, the Growth Management Act (see Section 2.2.3 above), the State Environmental Policy Act, tribal agreements and case law, the Watershed Planning Act, the Water Resources Act, the Seashore Conservation Area, and the Salmon Recovery Act. A variety of agencies (e.g., Ecology, WDFW, WDNR) are involved in implementing these regulations or otherwise own shoreline areas. Ecology reviews all shoreline projects that require a shoreline permit, but has specific regulatory authority over shoreline conditional use permits and shoreline variances. Other agency reviews of shoreline developments are typically triggered by in- or over-water work, discharges of fill or pollutants into the water, or substantial land clearing.

Depending on the nature of the proposed development, State regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are avoided, minimized, and/or mitigated. During the comprehensive SMP update, the County will consider other State regulations to ensure consistency as appropriate and feasible, with the goal of streamlining the shoreline permitting process. A summary of some of the key State regulations and/or State agency responsibilities follows.

Hydraulic Code: Chapter 77.55 RCW (the Hydraulic Code) gives WDFW the authority to review, condition, and approve or deny "any construction activity that will use, divert, obstruct, or change the bed or flow of State waters." These activities may include stream alteration, culvert installation or replacement, pier and bulkhead repair or construction, among others. In a permit called a Hydraulic Project Approval (HPA), WDFW can condition projects to avoid, minimize, restore, and compensate for adverse impacts.

Section 401 Water Quality Certification: Section 401 of the federal Clean Water Act allows states to review, condition, and approve or deny certain federal permitted actions that result in discharges to State waters, including wetlands. In Washington, Ecology is the State agency responsible for conducting that review, with a primary review criteria of ensuring that State water quality standards are met. Actions within streams or wetlands within the shoreline zone that require a Section 404 permit (see below) will also need to be reviewed by Ecology.

Washington Department of Natural Resources: WDNR is charged with protecting and managing use of State-owned aquatic lands. WDNR manages more than 5.6 million acres of State-owned forest, range, commercial, agricultural, conservation, and aquatic lands. WDNR manages these lands for revenue, outdoor recreation, and habitat for native fish and wildlife.

Water-dependent uses waterward of the OHWM require review by WDNR to establish whether the project is on State-owned aquatic lands. Certain project activities, such as single-family or two-party joint-use residential piers, on State-owned aquatic lands are exempt from these requirements. WDNR recommends that all proponents of a project waterward of the OHWM contact WDNR to determine jurisdiction and requirements.

WDNR also implements and enforces the Forest Practices Act and Forest Practices Rules. The Forest Practices Act applies to primarily all non-federal and non-tribal forestland. The forest practices rules include standards to maintain and restore aquatic and riparian habitat. The rules were incorporated into a State-wide Forest Practices Habitat Conservation Plan for federally threatened and endangered species in 2005.

Watershed Planning Act: The Watershed Planning Act of 1998 (Chapter 90.82 RCW) was passed to encourage local planning of local water resources, recognizing that there are citizens and entities in each watershed that "have the greatest knowledge of both the resources and the aspirations of those who live and work in the watershed; and who have the greatest stake in the proper, long-term management of the resources." The Chehalis Basin Partnership has been actively involved in watershed planning, resulting in production of a Watershed Management Plan (Grays Harbor County 2004) and a Detailed Implementation Plan (Chehalis Basin Partnership 2008). The Queets-Quinault and Willapa watersheds did not elect to work under the Watershed Planning Act.

Washington State Parks and Recreation Commission - Seashore Conservation Area: The Seashore Conservation Area (SCA), established in 1967, includes lands between the line of mean high tide and the line of mean low tide from Cape Disappointment to Ledbetter Point in Pacific County, from Toke Point in Pacific County to the south jetty in Grays Harbor County, and from Damon Point in Grays Harbor County to the Makah Indian Reservation, excluding areas within any Indian reservation (RCW 79A.05.605). The purpose of the SCA is "to contribute toward providing people an opportunity to enhance their lives through recreational leisure time experiences and cause our environment to be protected, our heritage preserved, and our natural resources conserved" (Washington State Parks & Recreation Commission 2001).

The SCA establishes standards for ocean beach management, including provisions that regulate vehicular traffic within the SCA and mining for sand. In addition, State Parks has the responsibility to oversee the Seashore Conservation Line (SCL) survey approximately every 10 years, beginning in 1968. These surveys determine the rate of erosion and accretion, clarify ownership of "new" lands adjacent to Parks' properties, and assist in the overall management of the SCA. The repeated surveys are also mandated by Deeds of Dedication, which gave to the State, for public use, some of the accreted lands lying east and west of the SCL. The information gathered by the SCL surveys has helped southwest Washington city, county, and State agencies, local businesses, and landowners to make land use decisions about conservation, stewardship and development issues. Issues of boundaries and jurisdictions have historically been contentious; so the SCL surveys are a useful tool when issues of land ownership or user's rights are brought up.

Objectives set forth by the Washington State Parks and Recreation Commission for the ocean beaches in Grays Harbor and Pacific Counties include the following:

1. Acquire key ocean beach areas including lands west of the high tide line of 1889;
2. Acquire, one per biennium, a right-of-way for public recreational access to State-owned tidelands and beaches within the State's Seashore Conservation Area;
3. Develop two ocean beach access areas per biennium;
4. Develop, one per biennium, a major saltwater, shoreland, or upland park providing public access to State-owned tidelands and beaches in the south Pacific County Coast (Washington State Parks & Recreation Commission 2001).

Washington State Parks regulates ocean beach activities, including vehicular traffic, beach sand mining and recreational activities within the SCA and consistent with locally adopted and State Parks Commission approved ocean beach recreation management plans and other agency rules.

Marine Waters Planning and Management Act: The Marine Waters Planning and Management Act (RCW 43.372) authorizes agencies with marine waters planning and management responsibilities to include marine spatial data and marine spatial planning elements in existing and ongoing planning. The Act also directs Ecology to work with other State agencies with marine management responsibilities, tribal governments, marine resources committees, local and federal agencies, and marine waters stakeholders to compile marine spatial information and to incorporate this information into ongoing plans. The marine interagency team shall coordinate the development of a comprehensive marine management plan for the State's marine waters, which includes marine spatial planning.

Ocean Resources Management Act: The Ocean Resources Management Act (RCW 43.143) establishes policies that are intended to protect the functions and values of the State's ocean resources. These policies are summarized as follows:

- No leasing of Washington's tidal or submerged lands for purposes of oil or gas exploration, development, or production;
- Priority to resource uses and activities that will not adversely impact renewable resources; and
- Encourage the conservation of liquid fossil fuels, and explore available methods of encouraging such conservation.

The Act establishes criteria for federally, State, or locally permitted uses or activities that will adversely impact renewable resources, marine life, fishing, aquaculture, recreation, navigation, air or water quality, or other existing ocean or coastal uses. Those criteria are listed as follows:

- There is a demonstrated significant local, State, or national need for the proposed use or activity;
- There is no reasonable alternative to meet the public need for the proposed use or activity;
- There will be no likely long-term significant adverse impacts to coastal or marine resources or uses;
- All reasonable steps are taken to avoid and minimize adverse environmental impacts, with special protection provided for the marine life and resources of the Columbia River, Willapa Bay and Grays Harbor estuaries, and Olympic National Park;

- All reasonable steps are taken to avoid and minimize adverse social and economic impacts, including impacts on aquaculture, recreation, tourism, navigation, air quality, and recreational, commercial, and tribal fishing;
- Compensation is provided to mitigate adverse impacts to coastal resources or uses;
- Plans and sufficient performance bonding are provided to ensure that the site will be rehabilitated after the use or activity is completed; and
- The use or activity complies with all applicable local, State, and federal laws and regulations.

The Act also establishes the Washington Coastal Marine Advisory Council to communicate and collaborate with federal, State, and local agencies and entities on coastal issues, including coastal resource policy, planning, and management issues, and to advise the governor, legislature, and State and local agencies on specific coastal waters resource management issues. The Advisory Council's role also includes identifying and pursuing funding opportunities for relevant programs and activities of member entities.

2.4 Federal Regulations

Federal regulations most pertinent to development in the County's shorelines include the Endangered Species Act, the Clean Water Act, and the Rivers and Harbors Appropriation Act. Other relevant federal laws include the National Environmental Policy Act, the Anadromous Fish Conservation Act, the Clean Air Act, the Marine Mammal Protection Act, the Coastal Zone Management Act, the National Historic Preservation Act, and the Migratory Bird Treaty Act. A variety of agencies (e.g., U.S. Army Corps of Engineers [Corps], National Marine Fisheries Service [NMFS], U.S. Fish and Wildlife Service [USFWS]) are involved in implementing these regulations. Review of shoreline development by these agencies in most cases would be triggered by in- or over-water work or discharges of fill or pollutants into the water. Depending on the nature of the proposed development, federal regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are avoided, minimized, and/or mitigated. During the comprehensive SMP update, the County will consider other federal regulations to ensure consistency as appropriate and feasible, with the goal of streamlining the shoreline permitting process. A summary of some of the key federal regulations and/or federal agency responsibilities follows.

Clean Water Act: Major components of the Clean Water Act include Section 404, Section 401, and the National Pollutant Discharge Elimination System (NPDES).

Section 404 provides the Corps, under the oversight of the U.S. Environmental Protection Agency, with authority to regulate "discharge of dredged or fill material into waters of the United States, including wetlands." The extent of the Corps' authority and the definition of fill have been the subject of considerable legal activity. As applicable to the County's shoreline jurisdiction, however, it generally means that the Corps must review and approve most activities in streams and wetlands. These activities may include wetland fills, stream and wetland restoration, culvert installation or replacement, among others. The Corps requires projects to avoid, minimize, and compensate for impacts.

A Section 401 Water Quality Certification is required for any applicant for a federal permit for any activity that may result in any discharge to waters of the United States. States and tribes may deny, certify, or condition permits or licenses based on the proposed project's compliance with water quality standards. In Washington, Ecology has been delegated the responsibility by the U.S. Environmental Protection Agency for managing implementation of this program.

The NPDES is similar to Section 401, and applies to ongoing point-source discharge. Permits include limits on what can be discharged, monitoring and reporting requirements, and other provisions designed to protect water quality. Examples of discharges requiring NPDES permits include municipal stormwater discharge, wastewater treatment effluent, or discharge related to industrial activities.

Rivers and Harbors Act: Section 10 of the federal Rivers and Harbors Appropriation Act of 1899 provides the Corps with authority to regulate activities that may affect navigation of "navigable" waters. Designated "navigable" waters in Grays Harbor County are listed below.

- Pacific Ocean
- Grays Harbor
- Queets River (tidal to River Mile (RM) 1)
- Humptulips River (tidal to RM 1)
- Hoquiam River (tidal to RM 7, navigable to RM 8)
- East Fork Hoquiam River (tidal to RM 6.5)
- Wishkah River (navigable to RM 11)
- Chehalis River (navigable to RM 68)
- Johns River (navigable to RM 4)

Proposals to construct new or modify existing over-water structures (including bridges), to excavate or fill, or to "alter or modify the course, location, condition, or capacity of" navigable waters must be reviewed and approved by the Corps.

Federal Endangered Species Act (ESA): Section 9 of the ESA prohibits "take" of listed species. Take has been defined in Section 3 as: "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The take prohibitions of the ESA apply to everyone, so any action that results in a take of listed fish or wildlife would be a violation of the ESA and is strictly prohibited. Per Section 7 of the ESA, activities with potential to affect federally listed or proposed species and that require federal approval, receive federal funding, or occur on federal land must be reviewed by the NMFS and/or USFWS via a process called "consultation." Activities requiring a Section 10 or Section 404 permit also require such consultation if these activities occur in waterbodies with listed species.

Coastal Zone Management Act (CZMA): The CZMA consists of three programs, the National Coastal Zone Management Program, the National Estuarine Research Reserve System, and the Coastal and Estuarine Land Conservation Program. Section 307 of the CZMA, called the "federal consistency" provision, requires that federal actions that have reasonably foreseeable effects on any coastal use or resource be consistent with the enforceable policies of a state's federally approved coastal management program. In the State of Washington, the coastal management program is encompassed by six state laws, including:

- the Shoreline Management Act (including local government shoreline master programs)
- the State Environmental Policy Act (SEPA)
- the Clean Water Act
- the Clean Air Act
- the Energy Facility Site Evaluation Council (EFSEC)
- the Ocean Resource Management Act (ORMA)

Federal agency activities must be consistent to the maximum extent practicable with the enforceable policies of a state coastal management program. To the extent that the County's SMP establishes enforceable policies for uses and modifications in the marine environment, the SMP can be a tool to help ensure that federal actions are consistent with the County's marine management objectives.

2.5 Tribal Regulations

Quinault Tribe Hydraulic Permit: Anyone conducting any activity within 200 feet of water (a creek, river, spring, wetland or the ocean) must submit a Hydraulic Project Application to the Quinault Department of Natural Resources for approval.

2.6 Regulatory Framework - Special Topics

2.6.1 Dredging

Dredging projects typically involve multiple agencies. The following discussion assumes that new permits are required for a dredging project (as opposed to performing the dredging under an existing permit). Known ongoing maintenance dredging includes the annual dredging of the Grays Harbor navigational channel. Applicants for new dredging projects must obtain permits from the Corps, Ecology, WDFW, and the local government with jurisdiction. Before applying for a permit, an applicant must obtain a Suitability Determination or other decision document from the Dredged Material Management Program that evaluates the proposed project. As part of the Corps process, Endangered Species Act consultation with the USFWS and the NMFS will be conducted. If in-water disposal is proposed, a Site Use Authorization from WDNR is also required.

2.6.2 Ocean Energy Projects

As is discussed below in Section 3.4.4 of this document, there has been some interest in the potential for wave, tidal, or offshore wind energy to be produced in the Grays Harbor area. In general, the location of a proposed project would determine the applicable regulatory processes. The permitting process varies according to whether such a project is proposed in State waters (less than three miles offshore) or in federal waters (beyond three miles offshore).

The Federal Energy Regulatory Commission (FERC) issues authorizations for such projects in State waters. “Preliminary permits” allow project-related studies to be performed. Licenses allow the actual construction of a project. The licensing process incorporates most State authorizations and typically takes years to complete. Shoreline permits would also be required for projects in State waters. In 2008, FERC issued a preliminary permit for an ocean energy project in State waters in Grays Harbor County. The applicant reported that it conducted field studies as a part of the preliminary permit in 2009. However, the preliminary permit was cancelled in 2010 because the permittee failed to submit its Notice of Intent and Draft Application documents by the established deadlines (FERC 2010).

In federal waters (beyond three miles offshore outside of shoreline jurisdiction), both the FERC and the Bureau of Ocean Energy Management (BOEM) have regulatory authority. For wave, tidal, and current projects, BOEM has jurisdiction to issue leases, while FERC has jurisdiction to issue licenses. It should be noted that even projects in federal waters will likely require transmission lines that will pass through State waters. These transmission lines would require a FERC license and a shoreline permit.

3 SUMMARY OF COUNTY ECOSYSTEM CONDITIONS

3.1 Climate

Grays Harbor County is located in a temperate maritime climate. Precipitation is high throughout Grays Harbor County. Average annual precipitation is highest in the Olympic Mountain drainages, reaching over 200 inches (Smith and Caldwell 2001). Precipitation is concentrated in the winter months, and much of this precipitation falls as snow at higher elevations (above 3,000 feet) in the Olympic Mountains, while most falls as rain at lower elevations (below 1,500 feet). Areas between 1,500 and 3,000 feet receive a mix of rain and snow.

3.2 Geology

Grays Harbor County is located in the Olympic Mountain and Willapa Hills physiographic regions. These two regions have distinct geology that drives differences in physical and ecological patterns on the landscape. The following descriptions of these regions are derived from Lasmanis' Geology of Washington (1991).

Olympic Mountains

A thick pile of oceanic basalt, known as the Crescent Formation, erupted during the middle Eocene, about 50 million years ago. During the middle Miocene, convergence of the Juan de Fuca plate with the North American plate caused subduction of the Juan de Fuca Plate and uplift of the Olympic Mountains and the Crescent Formation. As subduction accelerated, it resulted in a mix of broken sedimentary, volcanic, and metamorphic rocks along the west flank of the Olympics known as the Hoh melange, which are exposed along 45 miles of the western coast.

During the Pleistocene, alpine glaciers left thick deposits of sand and gravel over valley bottoms and coastal plains. Raised platforms along the west coast are a result of periods of uplift.

As sea levels rose at the close of the Pleistocene, the seaward ends of river valleys became flooded (Gonor et al. 1988). The main channels of these drowned rivers remain as the central, deeper channels of modern estuaries. Estuaries along the coast also show evidence of repeated episodes of sudden submergence associated with subduction earthquakes.

Willapa Hills

The Willapa Hills region is located south of the Olympic Mountains and includes the Black Hills, Doty Hills, and the broad valleys that lead to the Pacific Ocean. Barrier beaches along the outer coast create the major estuaries of Grays Harbor and Willapa Bay.

Sequences of exposed tertiary igneous and sedimentary rocks of Eocene through Miocene age are present in the Willapa Hills. Geological features and fossils demonstrate the presence of a marine shoreline along the eastern side of the Willapa Hills during the Tertiary period.

During the middle and late Miocene Columbia River basalt flowed down the Columbia River to the Pacific Ocean, Willapa Bay, and Grays Harbor. Unlike the Olympic Mountains, the Willapa Hills were not subject to subduction or metamorphism. The Willapa Hills have rounded topography and deep weathering profiles. During the Pleistocene, melt waters from the western foothills of the Cascades formed a major river in the Chehalis Valley. As sea levels rose after the last glacial period, the lower end of the Chehalis River was flooded, forming Grays Harbor.

3.3 Key Species and Habitats

Grays Harbor County includes freshwater, estuarine, and marine shorelines and their associated shorelands. Most species within the County are predominantly associated with one of these habitats, although several (including salmonids) bridge multiple habitats.

3.3.1 Freshwater Habitats

Key habitats associated with freshwater shorelines include riparian habitats, floodplains, wetlands, and upland forests and grasslands.

Riparian areas provide a broad range of critical functions for water quality and habitat. Water quality functions include filtration of nutrients, bacteria, sediment, and other contaminants (Naiman and Decamps 1997, Mayer et al. 2007). Functions important to fish and wildlife habitats include microclimate regulation, invertebrate and detrital food sources for juvenile fish, shaded cover, and woody debris recruitment (Naiman and Decamps 1997). Floodplain habitats act as an extension of riparian areas. Floodplains often include off-channel rearing habitats and wetlands, and provide pulses of organic detritus and insect prey following flood events.

Wetlands provide habitat for fish, and wildlife, moderation of flood impacts, and filtration and assimilation of nutrients and contaminants (Mitsch and Gosselink 2000). The relative value of wetland functions varies based on landscape position; location relative to streams, rivers, and lakes; and surrounding development. In recognition of these differences, the hydrogeomorphic

(HGM) approach to wetland classification was developed, which accounts for geomorphic setting, water source, and water transport (Brinson 1993, Smith et al. 1995). The primary freshwater HGM classifications in Grays Harbor County and brief descriptions follow.

- **Depressional** wetlands occur in topographic depressions. Dominant water sources are precipitation, ground water discharge, and runoff. When present, flow is typically directed toward the center of the depression. Interdunal wetlands, discussed below, are typically depressional.
- **Riverine** wetlands occur in floodplains and riparian corridors. Dominant water sources are overbank flow from the channel or hyporheic flow. Flow is predominantly unidirectional, flowing downstream. Surge plain wetlands, discussed below, are a type of riverine wetland.
- **Slope** wetlands occur on sloping lands. Dominant water sources are ground water and precipitation. Flow is predominantly unidirectional.
- **Flats** occur on broad, flat lands, including large, historic floodplains and deflation plains. Water sources are predominantly precipitation; ground water is not a major water source. Water loss primarily occurs through infiltration and seepage. Deflation plain interdunal wetlands, described below, may be classified as flats.
- **Lake fringe** wetlands occur adjacent to lakes. Dominant water source is the water elevation of the lake. Flow is bidirectional, rising and falling with lake levels.

Surge plain wetlands are tidal freshwater wetlands that provide unique habitat features, such as mature sitka spruce forested wetlands and freshwater tidal sloughs, as well as storage of high flows. The largest surge plain wetland in the State is located on the Chehalis River, and surge plain wetlands are also present on the Wishkah, Humptulips, and Hoquiam Rivers.

Interdunal wetlands frequently occur behind stabilized foredunes, either in small depressions or as larger deflation plains. Wiedemann (1984) listed 168 species of birds, 31 species of mammals, 10 amphibian species, and 3 reptile species occurring in association with the Pacific Northwest coastal dune ecosystem. In addition to supporting a wide diversity of wildlife, interdunal wetlands are frequently associated with many rare and endangered plant species and their associated fauna (Crawford 2011). Rapid rainwater infiltration in coastal dunes helps recharge freshwater aquifers and limit potential saltwater intrusion. Because there is typically little elevation differe groundwater nce between adjacent interdunal wetlands, slight differences in water level may ini tiate flow from one wetland to another (Crawford 2011). Under natural conditions, individual wetland locations may shift seasonally or inter-annually through natural sand movement and vegetation succession (Crawford 2011). A research study of the Long Beach Peninsula in Pacific County documented high infiltration rates within the sand dunes

(Blakemore 1995). During winter months, up to 40 percent of the groundwater recharge occurring in the Long Beach dunes discharges to surface waters (Blakemore 1995). Because interdunal wetlands rapidly drain to the underlying aquifer and the Pacific Ocean, the Shoreline Hearings Board determined in 1993 that interdunal wetlands in the City of Westport, Washington, "are in hydraulic continuity with the Pacific, and so they are associated wetlands of the Pacific, and thus subject to Shoreline Management Act jurisdiction"(Shorelines Hearings Board 1993).

Land cover has a significant effect on water flow through a watershed. A loss of forested vegetation cover, associated with development, is correlated with increased high flows, increased variability in daily streamflow, reduced groundwater recharge, and reduced summer low flow conditions (Burges et al. 1998, Jones 2000, Cuo et al. 2009). Changes in hydrology related to development are generally associated with soil compaction, draining, and ditching across the landscape; increased impervious surface cover; and decreased forest cover (Moore and Wondzell 2005).

3.3.2 Estuarine and Marine Habitats

Key habitats associated with estuarine and nearshore marine habitats in Grays Harbor County are described below.

Dunes

The County's Pacific Coast shoreline consists of coastal sand dunes from the Pacific County boundary, north to Copalis Beach. The dunes extend inland as little as 500 feet to as much as 7,000 feet (Kliem and Holden 2012). Coastal sand dunes provide a number of important functions, including protected habitat for shorebirds and wildlife, groundwater recharge, water quality protection, physical backshore protection, and recreation (City of Long Beach 2000). See discussion of interdunal wetlands in Section 3.3.1, above.

Marine Riparian

North of Copalis Beach, the coastal dune shoreline transitions to one dominated by forested bluffs. Intact marine riparian vegetation in the northern portion of the County provides a variety of ecological functions, including water quality protection, sediment control, wildlife habitat, nutrient filtration, microclimate control, insect food sources for juvenile fish, shaded cover, and woody debris to help build complex habitat and stabilize beach substrate (Brennan and Culverwell 2005). Marine riparian vegetation helps stabilize slopes and protect against landslides and other erosion hazards.

Beaches

Whereas coarser grain gravels predominate beaches in the bluff-backed beaches in the northern portion of the County, sandy flat beaches predominate to the south. The finer-grained beaches tend to have higher levels of primary productivity and to support more benthic infauna (e.g., amphipods, isopods, polychaete worms, and patches of razor clams) (Dethier 1991 in Skewgar and Pearson 2011).

Intertidal beaches provide spawning substrate for forage fish including surf smelt and sand lance. A recent survey of potential spawning habitats on the outer coast of Washington identified smelt eggs at ten stations, primarily north of Grays Harbor County, but including one site just south of the mouth of the Queets River (Langness et al. 2013). In previous studies, sand lance have been documented to spawn in Grays Harbor and in Grenville Bay just south of the mouth of the Quinault River (Langness et al. 2013).

Cobble to fine sand beaches and tidal sand and mudflats are important habitats for many shellfish species. Shellfish beds perform a number of important ecological functions including cycling nutrients, stabilizing substrates, creating habitat structure, and providing food for a wide variety of marine invertebrates, birds, fish, and mammals. Fish such as sole, surfperch, and staghorn sculpins use high energy nearshore beaches (Skewgar and Pearson 2011). Intertidal beaches, salt marshes, and mudflats throughout the County also provide roosting and foraging opportunities for over 500,000 shorebirds annually during spring and fall.

Estuarine Habitats

Shallow-water estuarine ecosystems, like tidal marshes, are particularly important habitats for the rearing of small, subyearling ocean-type Chinook salmon during estuarine residency (Levings et al. 1991, 1995, Bottom et al. 2005). Shallow water habitats may provide spatial separation from aquatic predators that reside in deeper waters, improved protection from predators through higher turbidity levels (Gregory and Levings 1998), as well as improved foraging capacity (Levings et al. 1991).

Eelgrass beds provide habitat for invertebrates and diverse fish assemblages, including juvenile and subadult salmonids and spawning herring (Hosack and Dumbauld 2006). Within Grays Harbor, the outer edges of native salt-marshes, rockweed (*Fucus*), sea-lettuce (*Ulva*), pickleweed (*Salicornia*) and salt-grass (*Distichlis*) also provide spawning habitats for herring (Penttila 2007). Eelgrass beds also entrain sediment and detritus. They are a major organic carbon source in nearshore areas and attenuate wave and current energy (Miller et al. 1980, Steneck et al. 2003). Eelgrass beds require soft substrate for establishment and the depth of eelgrass beds is controlled by the level of ambient light (Mumford 2007).

Rocky Shores

Rocky and mixed substrate shorelines occur in the northern portion of the County's shorelines. Wave energy is reduced in the lee of rocks and kelp beds, creating diverse habitat structure, including intertidal and subtidal tidepools that support a range of species. The mixed substrate shorelines in the northern portion of the County create habitats occupied by "a unique subset of sand-loving rocky-shore organisms" (Skewgar and Pearson 2011).

Kelp requires high ambient light, hard substrate, minimum turbidity during settlement, fairly low marine water temperatures, and moderate to high salinities (Mumford 2007). Kelp beds are mapped north of Point Grenville, in association with rocky coastal areas (Washington Department of Natural Resources 2005). Floating kelp mats can also provide habitat structure in nearshore pelagic habitats (see below).

In addition to marine fish and invertebrates that use the rocky shoreline, small mammals and shorebirds forage in and around the rocky shore. Seabirds and birds of prey nest on the rocky cliffs. Harbor seals and fur seals may use rocky platforms as pupping sites and haul-outs (Skewgar and Pearson 2011).

Nearshore Pelagic

The Pacific Ocean out to the three-mile boundary of territorial waters is characterized as the nearshore pelagic zone. Depths within this zone are less than 200 m. Plankton forms the base of the nearshore pelagic food web. The distribution and abundance of plankton varies daily, seasonally, and interannually, depending on upwelling, currents, and wind. The distribution of plankton affects the distribution and settlement of planktonic larvae of marine fishes and invertebrates, as well as the food supply for planktivores and higher trophic level marine life (e.g., fish, seabirds, marine mammals).

3.3.3 Priority Habitats and Species

Table 3-1 includes a list of priority habitats and habitat features identified by WDFW as occurring in Grays Harbor County. Table 3-2 includes a list of priority animal species, and Table 3-3 addresses priority plant species in the County. Although most of these species and habitats occur in shoreline jurisdiction, it is possible that some of them may occur exclusively outside of shoreline jurisdiction. Where specific occurrences have been identified within shoreline jurisdiction, these are mapped in Maps 15-17 of the Inventory Mapfolio (Appendix B). These maps do not show all occurrences; therefore, it is not possible to definitively identify those species and habitats that do not occur in shoreline jurisdiction at this time.

Table 3-1. Priority habitats and features in Grays Harbor County
(Source: WDFW 2008)

Priority Habitats and Features	Description
Biodiversity Areas & Corridors	Areas of habitat that are relatively important to various species of native fish and wildlife.
Herbaceous Balds	Variable-sized patches of grass and forb vegetation located on shallow soils over bedrock that commonly is fringed by forest or woodland.
Old-Growth/Mature Forest	Old Growth: Forest stands >3 ha (7.5 acres) having at least 2 tree species, forming a multi-layered canopy with occasional small openings and meeting specific size standards for trees, snags, and downed wood (over 200 years old) Mature: Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth (80 - 200 years old).
Oregon White Oak Woodlands	Stands of oak or oak/conifer associations >1 acre, where canopy coverage of the oak component of the stand is 25%; or where total canopy coverage of the stand is <25%, but oak accounts for at least 50% of the canopy coverage.
West Side Prairie	Herbaceous, non-forested (<60% forest canopy cover) plant communities that can either take the form of a dry prairie where soils are well-drained or a wet prairie.
Riparian	The area adjacent to flowing or standing freshwater aquatic systems. Riparian habitat encompasses the area beginning at the ordinary high water mark and extends to that portion of the terrestrial landscape that is influenced by, or that directly influences, the aquatic ecosystem.
Freshwater Wetlands & Fresh Deepwater	Freshwater wetlands: Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Fresh deepwater: Permanently flooded lands lying below the deepwater boundary of wetlands (6 feet).
Instream	The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.
Open Coast Nearshore	Relatively undisturbed non-estuarine nearshore of Washington's outer coast, from the Canadian border south to the Oregon border, encompassing shore, intertidal, and subtidal areas.
Coastal Nearshore	Relatively undisturbed nearshore estuaries of Washington's outer coast, including Grays Harbor, Willapa Bay and the mouth of the Columbia River, encompassing shore, intertidal, and subtidal areas.
Caves	A naturally occurring cavity, recess, void, or system of interconnected passages (including associated dendritic tubes, cracks, and fissures) which occurs under the earth in soils, rock, ice, or other geological formations, and is large enough to contain a human.
Cliffs	Greater than 7.6 meters (25 feet) high and occurring below 1524 meters (5000 feet).
Snags and Logs	Priority snags have a diameter at breast height of > 51 cm (20 in) and are > 2 m (6.5 feet) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 feet) long.
Talus	Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 feet), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

Table 3-2. Priority fauna in Grays Harbor County
(Source: WDFW 2008).

Category	Species/ Habitats	State Status	Federal Status
Freshwater Fish	Olympic Mudminnow	Sensitive	
Diadromous Fish	Sockeye Salmon	Candidate	Endangered- Snake River
	Bull Trout	Candidate	Threatened
	Chinook Salmon	Candidate	Threatened
	Chum Salmon	Candidate	Threatened
	Coho Salmon		Threatened – Lower Columbia
	Steelhead Trout	Candidate	Threatened
	Eulachon	Candidate	Threatened
	Green Sturgeon		Threatened
	River Lamprey	Candidate	Species of Concern
	Coastal Resident./ Searun Cutthroat		Species of Concern
	Pacific Lamprey		Species of Concern
	Kokanee		
	Pink Salmon		
	White Sturgeon		
	Longfin Smelt		
Marine Fish	Bocaccio Rockfish	Candidate	Endangered
	Yelloweye Rockfish	Candidate	Threatened
	Canary Rockfish	Candidate	Threatened
	Pacific Cod	Candidate	Species of Concern
	Pacific Hake	Candidate	Species of Concern
	Walleye Pollock	Candidate	Species of Concern
	Brown Rockfish	Candidate	Species of Concern
	Copper Rockfish	Candidate	Species of Concern
	Quillback Rockfish	Candidate	Species of Concern
	Black Rockfish	Candidate	
	China Rockfish	Candidate	
	Greenstriped Rockfish	Candidate	
	Redstripe Rockfish	Candidate	
	Tiger Rockfish	Candidate	
	Widow Rockfish	Candidate	
	Yellowtail Rockfish	Candidate	
	Pacific Herring	Candidate	Species of Concern
	Surf Smelt		
	Pacific Sand Lance		
	English Sole		
	Rock Sole		
	Lingcod		
Amphibians	Van Dyke's Salamander	Candidate	Species of Concern
	Western Toad	Candidate	Species of Concern
	Dunn's Salamander	Candidate	
Reptiles	Pacific Pond Turtle (Western Pond Turtle)	Endangered	Species of Concern
Birds	Short-tailed Albatross	Candidate	Endangered
	Snowy Plover	Endangered	Threatened
	Spotted Owl	Endangered	Threatened
	Streaked Horned Lark	Endangered	Threatened
	Marbled Murrelet	Threatened	Threatened

Category	Species/ Habitats	State Status	Federal Status
	Yellow-billed Cuckoo		Proposed Threatened
	Brown Pelican	Endangered	Species of Concern
	Peregrine Falcon	Sensitive	Species of Concern
	Bald Eagle	Sensitive	Species of Concern
	Common Loon	Sensitive	
	Northern Goshawk	Candidate	Species of Concern
	Tufted Puffin	Candidate	Species of Concern
	Brandt's Cormorant	Candidate	
	Common Murre	Candidate	
	Golden Eagle	Candidate	
	Western grebe	Candidate	
	Vaux's Swift	Candidate	
	Pileated Woodpecker	Candidate	
	Purple Martin	Candidate	
	W WA nonbreeding concentrations of Loons, Grebes, Cormorants, Fulmar, Shearwaters, Storm-petrels, Alcids		
	W WA breeding concentrations of Cormorants, Storm-petrels, Terns, Alcids		
	Great Blue Heron		
	Brant		
	Cavity-nesting ducks: Wood Duck, Barrow's Goldeneye, Common Goldeneye, Bufflehead, Hooded Merganser		
	Western Washington nonbreeding concentrations of Barrow's Goldeneye, Common Goldeneye, Bufflehead		
	Harlequin Duck		
	Trumpeter Swan		
	Waterfowl Concentrations		
	Mountain Quail		
	Sooty Grouse		
	Wild Turkey		
	W WA nonbreeding concentrations of Charadriidae, Scolopacidae, Phalaropodidae		
	Band-tailed Pigeon		
Marine Mammals	Blue Whale	Endangered	Endangered
	Humpback Whale	Endangered	Endangered
	Sperm Whale	Endangered	Endangered
	Orca (Killer Whale)	Endangered	Endangered
	Steller Sea Lion	Threatened	
	Gray Whale	Sensitive	
	Pacific Harbor Porpoise	Candidate	
	Dall's Porpoise		
	Harbor Seal		
	California Sea Lion		
	Fisher[1]	Endangered	Candidate
	Western Gray Squirrel	Threatened	Species of Concern

Category	Species/ Habitats	State Status	Federal Status
Terrestrial Mammals	Western Pocket Gopher	Threatened	Candidate
	Townsend’s Big-eared Bat	Candidate	Species of Concern
	Keen's Long-eared Bat (formerly Keen’s Myotis)	Candidate	
	Olympic Marmot	Candidate	
	Roosting Concentrations of Big-brown Bat, Myotis bats, Pallid Bat		
	Marten		
	Columbian Black-tailed Deer		
	Mountain Goat		
	Elk		
Marine Invertebrates	Olympia Oyster	Candidate	
	Butter Clam		
	Native Littleneck Clam		
	Manila Clam		
	Pacific Oyster		
	Razor Clam		
	Dungeness Crab		
	Pandalid shrimp (Pandalidae)		
	Red Urchin		
Moths/Butterflies	Queen Charlotte's Copper (formerly Makah Copper)	Candidate	Species of Concern
	Johnson's Hairstreak	Candidate	
	Puget Blue	Candidate	

Table 3-3. Priority plant species in Grays Harbor County
(Source: DNR electronic reference).

Scientific Name	Common Name	State Status	Federal Status
Carex anthoxanthea	Yellow-flowered sedge	Sensitive	
Carex circinata	Coiled sedge	Sensitive	
Carex macrochaeta[1]	Large-awned sedge	Threatened	
Cimicifuga elata[1]	Tall bugbane	Sensitive	Species of Concern
Claytonia multiscapa ssp. pacifica	Pacific lanceleaved springbeauty	Threatened	
Cochlearia groenlandica[1]	Scurvygrass	Sensitive	
Dodecatheon austrofrigidum	Frigid shooting-star	Endangered	Species of Concern
Erigeron aliceae	Alice's fleabane	Sensitive	
Erigeron peregrinus var. thompsonii	Thompson's wandering daisy	Sensitive	
Erythronium quinaultense	Quinault fawn-lily	Threatened	
Erythronium revolutum	Pink fawn-lily	Sensitive	
Montia diffusa[1]	Branching montia	Sensitive	
Parnassia palustris var. neogaea	Northern grass-of-parnassus	Sensitive	
Plantago macrocarpa	Alaska plantain	Sensitive	
Polemonium carneum[1]	Great polemonium	Threatened	

Scientific Name	Common Name	State Status	Federal Status
Ranunculus cooleyae	Cooley's buttercup	Sensitive	
Sanguisorba menziesii	Menzies' burnet	Threatened	
Sanicula arctopoides[1]	Bear's-foot sanicle	Endangered	Species of Concern
Sericocarpus rigidus	White-top aster	Sensitive	Species of Concern
Synthyris schizantha	Fringed synthyris		

1. Most recent record in Grays Harbor County was before 1977.

Salmonids use streams, rivers, and nearshore habitats throughout Grays Harbor County. Although Table 3-3 lists several salmonid populations (Evolutionary Significant Units [ESUs] or Distinct Population Segments [DPSs]) as threatened and endangered in the County, those listed populations generally spawn and rear in freshwater ecosystems associated with the Columbia River. With the exception of bull trout, salmonid populations that spawn and rear in the freshwater ecosystems of Grays Harbor County are not listed as threatened or endangered. Critical habitat for bull trout in Grays Harbor County includes the shorelines of the Pacific Ocean. Although they are not federally listed, coastal salmonid populations are afforded significant conservation status because of their ecological and commercial role in the County. Additionally, because of their relative health and the lower risks from growth and development, coastal salmon populations are important to long-term success of salmon populations in the Pacific Northwest (Miller 2003). Salmon populations that spawn in Grays Harbor County are listed in terms of ESUs and DPSs in Table 3-3, below.

Table 3-4. Salmonid populations in freshwater habitats in Grays Harbor County.

WRIA	Salmon Population
Queets/Quinault- 21	Washington Bull Trout (Threatened)
	Olympic Peninsula steelhead (summer and winter runs)
	Quinault Lake sockeye
	Olympic Peninsula coho
	Pacific coast chum
	Washington coast Chinook (spring, summer, and fall runs)
	Pink salmon
	Resident/Sea run cutthroat trout
Chehalis- 22/23	Washington Bull Trout (Threatened)
	Southwest Washington steelhead (summer and winter runs)
	Southwest Washington coho
	Pacific coast chum
	Washington coast Chinook
	Resident/Sea run cutthroat trout
Willapa- 24	Washington Bull Trout (Threatened)
	Southwest Washington steelhead (winter run)
	Southwest Washington coho
	Pacific coast chum
	Washington coast Chinook

WRIA	Salmon Population
	Resident/Sea run cutthroat trout

3.3.4 Non-Native, Invasive Species

Several non-native and invasive species are present in the County, as identified in Table 3-5.

Non-native, invasive vegetation often forms dense monocultures that preclude native vegetation and alter the ecosystem. Potential effects of invasive plant species in riparian and instream habitats include increased instream water temperatures, lowered dissolved oxygen, changes in pH, reduced bank stability, altered flow conditions and increased localized flooding (Grays Harbor County Lead Entity 2011). In Grays Harbor, Japanese eelgrass (*Z. japonica*) is expanding into what had likely been unvegetated tidal flat, adding a complex structure of rhizomes and leaf blades. The ecological role of *Z. japonica* is not entirely understood, but studies indicate that it has an inverse relationship with the density of some benthic macrofauna (e.g., burrowing shrimp and copepods) and nearshore fish species (e.g., surf smelt, herring, sand lance, and juvenile chum salmon) (Reviewed in Mach et al. 2010). On the other hand, it also provides a significant foraging source for migratory waterfowl (Reviewed in Mach et al. 2010).

Non-native fauna can affect aquatic food webs and habitat structure through a variety of mechanisms. Sessile and sedentary organisms can alter substrate conditions for other species. Predatory fish, such as bass, can compete for prey or directly prey on early lifestages of sensitive, native fish. New Zealand mudsnails were recently discovered in a brackish area in the lower Chehalis River at the WDNR Blue Slough Access area. Experimental results indicate that large populations of New Zealand mudsnails could potentially limit the availability of other, more nutritious food sources for native rainbow trout (Vinson and Baker 2008). Non-native plankton, introduced through ballast water, may be associated with the increasing occurrence harmful algal blooms on the Washington Coast (Skewgar and Pearson 2011).

Table 3-5. Non-native, invasive species that are established or have the potential to establish in the shoreline areas of Grays Harbor County.

Based on species identified in the Chehalis Basin Salmon Restoration and Preservation Strategy for WRIA 22 and 23 (Grays Harbor County Lead Entity 2011)

	Established in Grays Harbor County?	Upland/riparian	Freshwater	Estuarine/Marine
Vegetation	Yes	• Bohemian knotweed • Giant knotweed	• Brazilian elodea • Parrot feather phragmites	Japanese eelgrass

	Established in Grays Harbor County?	Upland/riparian	Freshwater	Estuarine/Marine
		• Himalayan knotweed • Japanese knotweed • English ivy • Yellow flag iris • Purple loosestrife • Spartina		
Aquatic mammals	Yes	Nutria	Nutria	
Mollusks	Yes		• Corbicula • New Zealand mudsnails	• Japanese oyster • Japanese oyster drill
	Potential		• Zebra mussels • Quagga mussels • Asian clam (introduced)	Other non- native saltwater clams
Crustaceans	Yes			European green crab
	Potential		Non-native freshwater crayfish	
Fish	Yes		• Atlantic Salmon • Rock Bass • Largemouth & Smallmouth Bass • Sunfish • Bullhead Catfish	Atlantic salmon
	Potential		• Yellow Perch • White Perch • Black Crappie	
Chordates	Yes			• Club Tunicate • Transparent Ciona Tunicate • Invasive Didemnum

3.4 Watershed Setting and Conditions

Portions of three major watersheds are located within the County: the Queets-Quinault Watershed, the Chehalis Watershed, and the Willapa Watershed. Generally, these watersheds are identified by the State as Water Resource Inventory Areas (WRIA). Because of its large size, the upper and lower portions of the Chehalis River Watershed comprise two WRIAs. A map of the WRIAs within Grays Harbor County is provided in Figure 3-1. Marine and estuarine shorelines are discussed separately below.

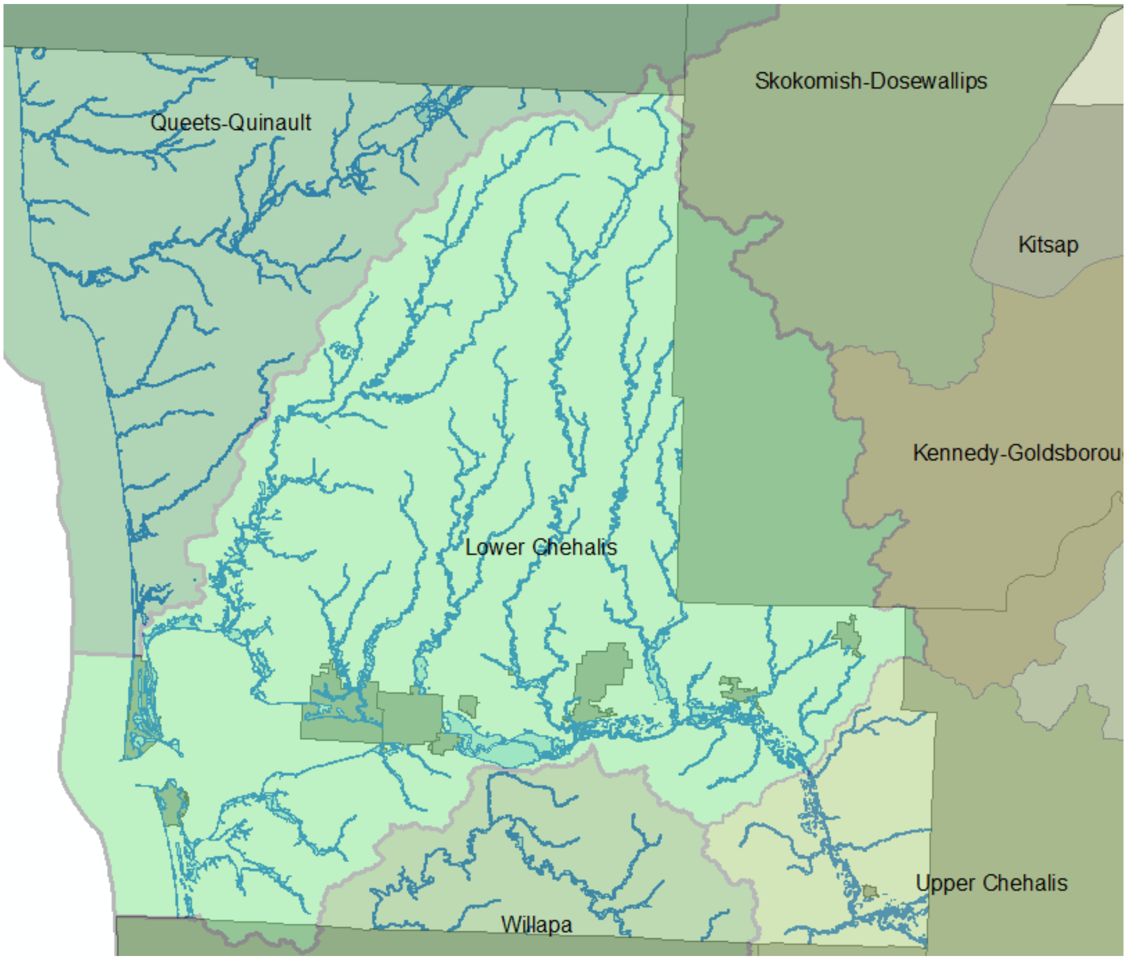


Figure 3-1. Map of Water Resource Inventory Areas in Grays Harbor County

3.4.1 Queets-Quinault (WRIA 21)

WRIA 21 encompasses an area of 755,674 acres along the Pacific Coast of the Olympic Peninsula. It includes the watersheds of the Queets/Clearwater, Quinault, Moclips, Raft, and Copalis Rivers, Kalaloch Creek, plus several small streams that flow directly into the Pacific Ocean. These watersheds originate from glaciers and snowmelt from the Olympic Mountains and flow across an extensive coastal plain prior to entering the Pacific Ocean. Glaciers have receded over the past 70 years, and, as a result, large volumes of coarse sediment are being mobilized in the upper portions of the watershed (WRIA 21 Lead Entity 2011). Rain-on-snow zones have been mapped in the middle to high elevations in the upper watershed of the Queets, Quinault, and Clearwater Rivers, primarily within Olympic National Park. More frequent rain-on-snow events, which may be expected with climate change, have the potential to destabilize channel features (WRIA 21 Lead Entity 2011).

The geomorphologic characteristics of rivers in the watershed are affected by slope, flow, sediment, and wood regimes. The steep topography and shallow soils of the tributaries in the Olympic Mountains have a high susceptibility to mass wasting events (Smith and Caldwell 2001). Because of the relatively flat terrain in the coastal piedmont, rivers have formed broad meanders in the lower reaches.

Historic Changes and Current Conditions

WRIA 21 includes areas that are relatively pristine, as well as areas that have been greatly affected by logging and land-use activities over the last century. The entire WRIA is included in the Usual and Accustomed Fishing and Hunting Area for the QIN (WRIA 21 Lead Entity 2011).

Much of WRIA 21 is in federal, State, or tribal ownership. Approximately 70 percent of the WRIA lies within the Olympic National Park or Olympic National Forest. Most or all of the forests within the QIR and U.S. Forest Service (USFS) ownership have been harvested at least once (Smith and Caldwell 2001). About one-third of the QIR is owned by the tribe, and approximately 50 percent is owned in Trust status by individuals and families of different tribes. The remaining lands (less than 15%) are owned "in fee" by non-Indians and timber companies. The QIN developed a 10-year Forest Management Plan for timberlands on the QIR. The Plan provides the goals, directions, and technical specifications for managing all the individually owned Trust lands and tribally owned lands on the QIR.

Timber harvest began in 1916, spurring the need for railroads and roads for access and transport. Timber harvest peaked between 1950 and the mid-1980's (Smith and Caldwell 2001). Harvest activities started on the flatter valley floor areas and progressed into steeper terrain. Increased road densities, stream crossings, and road construction on steep hillslopes amplified sediment inputs to many stream channels (Smith and Caldwell 2001). Following the 1994 Northwest Forest Plan, the management focus of National Forest lands shifted from fiber production to ecological restoration. Today, variable-density thinning (VDT) is the primary commercial thinning method used in Olympic National Forest. Currently, less than 0.5 percent of total forestlands are treated with this approach each year (USFS, electronic reference). Commercial harvest on private and WDNR lands, primarily in the Clearwater sub-basin, continued following the passage of the Northwest Forest Plan, although at a lower rate than seen during the 1980s (Smith and Caldwell 2001).

No dams or reservoirs occur within the WRIA, so the other major rivers in the WRIA have unimpeded movement of sediment and water from the headwaters in the Olympic Mountains to the Pacific Ocean.

Today, road crossings in the lower watershed have contributed to disconnected floodplains and increased sedimentation in the river (Smith and Caldwell, 2001).

The Quinault River estuary has reduced levels of large woody debris (LWD) and the lowest reaches of the Quinault River have been impacted by bank hardening and shoreline development, mostly on the south bank. Various attempts to protect the village of Taholah from ocean wave action have resulted in the construction of a seawall. Large rock continues to be added to the north end of the seawall, affecting the mouth of the Quinault River and the lowest portion of the estuary.

Water quality meets State and federal standards throughout most of the WRIA. Within Grays Harbor County, the only documented impairment is related to elevated PCB levels in fish tissue (Washington State Department of Ecology 2012).

3.4.2 Chehalis (WRIA 22/23)

The basin consists of approximately 2,766 square miles and spans eight counties. The Chehalis Watershed drains the western side of the Willapa Hills, the Black Hills, an area of low mountains on the west side of the Cascade Range, and the lower south slopes of the Olympic Range. The largest two tributaries to the Chehalis, the Satsop and Wynoochee Rivers, originate in the southern Olympic Mountains. The Humptulips, the Hoquiam and the Wishkah Rivers also originate in the southern Olympic Mountains and flow into Grays Harbor. The Chehalis River is a low gradient, slow-moving river. The unconfined channel flows through a 2-3 mile-wide valley formed by a glacial river. Watershed Geodynamics (2012) noted areas where the Chehalis River migrated laterally up to 1,500 feet between 1945 and 2009 in the eastern portion of the County. Instances of large channel avulsions were also noted between 1876 and 1945 (Watershed Geodynamics 2012).

The Johns and Elk Rivers flow into the South Bay of Grays Harbor. Grays Harbor is about 15 miles wide at the widest point, and at high tide covers about 91 square miles. A two-mile wide channel connects Grays Harbor to the Pacific Ocean.

Within Grays Harbor County, the topography includes steep, forested slopes of the southern Olympic Mountains; expansive alluvial floodplains associated with the Chehalis River valley; steep, forested slopes along the Coast Range foothills; and poorly drained estuarine wetlands associated with Grays Harbor.

Historic Changes and Current Conditions

Timber harvest occurred throughout the WRIA for most of the 20th century. Splash dams were created in the major rivers in the early part of the 20th century to transport wood downstream. While in place, these splash dams created barriers to fish passage. In addition, the frequent release of high flows during log drives removed natural LWD and accelerated channel incision, resulting in disconnected floodplains, the impacts of which are likely still observed today (Smith and Wenger 2001).

Excess sediment has been identified as a limiting factor in the Chehalis River. These sediment loads are likely related to a high density of forest roads, the reduction in instream LWD, logging practices that affect headwater streams, and erosion associated with agriculture (Smith and Wenger 2001, Grays Harbor County Lead Entity 2011). Fish passage barriers, resulting from the high density of roads, are also a concern throughout the upper portions of the WRIA.

Today, the majority of the total basin area (87%) is forestland; however, most urban, agricultural, and industrial development is concentrated along the river valleys (Grays Harbor County 2004). In fact, the Chehalis Watershed Management Plan reports that 42 percent of land within one mile of the major rivers in the basin is in agricultural, urban, or industrial uses.

Riparian conditions are degraded throughout most of the WRIA as a result of past forest and agricultural practices. Riparian buffer protection increased in the mid-1980s, and more recently with the 1999 Salmon Recovery Act and subsequent amendment of Forest Practices Rules. Although these protections do little to improve LWD recruitment potential in the short term, they improve the long-term LWD recruitment potential for the WRIA (Smith and Wenger 2001).

Gravel mining operations from the 1950s to the 1990s from river bars and/or floodplains on the Chehalis, Wynoochee, Satsop, Skookumchuck, and Newaukum Rivers have modified sediment transport processes and substrate within those watersheds (Collins 1995). Historically, the seemingly abundant alluvial gravels on river bars and floodplains provided a convenient supply of gravel for construction of roads in the County (Smith and Wenger 2001). Between the 1950s and 1980s, gravel bar mining occurred from RM 5-18 on the Chehalis River, and from RM 2.5-5.5, from RM 16-28 on the Humptulips River (Collins 1995), and from RM 2-11 on the Wynoochee River (Collins and Dunne 1986 in Smith and Wenger 2001). In 1986, a study documented that gravel extraction exceeded replenishment rates in the County (Collins and Dunne 1986 in Smith and Wenger 2001). As a result, the County updated its SMP to establish annual limits on gravel bar extraction for the Huptulips (6,500 cubic yards), Satsop (10,000 cubic yards), and Wynoochee Rivers (5,000 cubic yards). For rivers where replenishment rates studies have not been conducted, gravel bar mining is only permitted to control erosion, enhance fish and wildlife resources, reduce flood hazards, or for use on properties immediately adjacent to the gravel bar. Since 1972, State regulations have limited gravel bar skimming to a maximum depth of 2 feet below the low-water level, and the bar must be levelled upon completion to avoid stranding fish (Collins 1995).

Floodplain gravel mining has resulted in 50 floodplain mine lakes in the Chehalis Watershed, or approximately one-fifth of the total floodplain mine lakes in Washington State (Collins 1995). Floodplain mining pits are typically located behind levees. If a channel shifts course through a levee and into a floodplain mine lake, a process known as "pit capture," it has the potential to cause channel bank and bed instability upstream and downstream through accelerated erosion; river channelization; channel incision; disruption in sediment transport; and degradation of habitat, including benthic invertebrate assemblages and salmon spawning habitat, upstream and downstream of a pit (Cluer et al. 2005). Pit capture may present stranding hazards for native fish species, and gravel pits may provide warm water predator habitat (Cluer et al. 2005).

Water rights in the basin are overallocated; however, estimated actual water use is apparently much lower than what is allocated, allowing for continued instream flows (Grays Harbor County 2004). A study of streamflows showed that flows dropped below the regulatory minimum flows for part of the monitoring period at the stations in Grays Harbor County listed below.

- Newskah Creek
- East Fork Hoquiam River
- East Fork Wishkah River
- Middle Fork Satsop River
- Wishkah River

Major dams and diversion structures on the rivers of the basin in Grays Harbor County are listed below.

- Water supply diversions on the Hoquiam River
- Water supply diversion on the Wynoochee River
- Failor Lake Dam
- Lake Aberdeen Dam
- The Malinowski Dam on the Wishkah Rivers
- The Wynoochee Dam on the Wynoochee River

The Chehalis Indian Reservation is located near the mouth of the Black River in the southeastern corner of Grays Harbor County. Although the QIR was established outside the Chehalis Basin boundaries, members of the QIN have fished and hunted in the Chehalis Basin for centuries and its recognized usual and accustomed fishing areas include Grays Harbor and the Chehalis Basin, including the Humptulips River (Grays Harbor County 2004).

The lower, tidally influenced reaches of the Chehalis and Humptulips Rivers comprise fairly undeveloped floodplain and tidal slough habitats. In contrast, the tidally influenced portions of the Wishkah, Hoquiam, East Hoquiam, and Wynoochee Rivers are confined by commercial development, roads, or residential areas. Floodplain wetland and off-channel habitat connectivity further upstream in the Chehalis River, as well as the South Grays Harbor drainages, are limited by agriculture, roads, and residential development.

Shoreline armoring is limited along the streams and rivers in the WRIA, and areas of armoring are predominantly located outside of Grays Harbor County in the Upper Chehalis Watershed (Smith and Wenger 2001). In the eastern portion of the WRIA, outside of Grays Harbor County, the Chehalis River is incised and disconnected from the floodplain and potential off-channel habitats (Smith and Wenger 2001). A dike limits channel migration in the lower Humptulips River.

Water quality conditions in several waterbodies within the Chehalis basin are listed as impaired (303(d) listing by Ecology) or have established Total Maximum Daily Loads (TMDLs) to address known water quality impairments. Waterbodies identified as Category 5 (303(d)) and Category 4(A) (TMDL) in Ecology's 2012 evaluation are identified in Table 3-6.

Table 3-6. Impaired water quality parameters in freshwater shorelines in WRIAs 22 and 23 in Grays Harbor County
(Source: Ecology 2012).

Waterbody	Parameter	Year of qualifying data	Status
Black Creek	Temperature	1998	303(d)- impaired
Lower Chehalis River	PCB- tissue	2004	303(d)- impaired
	Mercury- tissue	2004	303(d)- impaired
Humptulips	pH	2004-2006	303(d)- impaired
	Dissolved oxygen	2004-2006	303(d)- impaired
	Temperature	1995-2001	TMDL
Wildcat Creek	Bacteria	1977-1987	TMDL- McCleary Wastewater Treatment
	Chlorine		
	Ammonia- N		
	Dissolved Oxygen	1977-1987	TMDL- Simpson
	Temperature		
Grays Harbor Tributaries	Bacteria	1997-2008	TMDL- Port of Grays Harbor
Black River	Bacteria	1989-1993	TMDL- Black River
	Dissolved oxygen	1989-1993	
Upper Chehalis River and tributaries	Bacteria	1989-2008	TMDL-Upper Chehalis
	Temperature	1990-2000	
Garrard Creek, Independence Creek, Rock Creek	Dissolved oxygen	1991-1994	

3.4.3 Willapa (WRIA 24) - North River

A portion of the North River basin of WRIA 24 extends north into Grays Harbor County. The North River flows north from the hills of Pacific County into Grays Harbor County, before heading south and draining into the northern portion of Willapa Bay. Major tributaries within Grays Harbor County include Salmon, Lower Salmon, Vesta, and Pioneer Creeks, and the Little North Fork River.

Historic Changes and Current Conditions

The North River Watershed is primarily in commercial forest uses. As a result of historic and ongoing forest uses, the watershed has a low level of LWD, poor riparian conditions, excess sediment inputs, and loss of estuary habitat as a result of dikes and tidegates (Applied Environmental Services 2001). Fish passage barriers, incised channels, and high summer water temperatures are also conditions that limit natural processes in the basin (Applied Environmental Services 2001). Waterbodies identified as Category 5 (303(d)) and Category 4(A) (TMDL) in Ecology's 2012 evaluation are identified in Table 3-7.

Table 3-7. Impaired water quality parameters in freshwater shorelines in WRIA 24 in Grays Harbor County
(Source: Ecology 2012)

Waterbody	Parameter	Year of qualifying data	Status
Joe Creek	Temperature	1996	303(d)- impaired
North River	Temperature	1996-1997	303(d)- impaired
East Fork North River	Temperature	1996	303(d)- impaired
Raimie Creek	Temperature	2001-2002	303(d)- impaired
	pH	2001-2002	303(d)- impaired
Upper Salmon Creek	Temperature	1997	303(d)- impaired
Sullivan Creek	Temperature	1996-2002	303(d)- impaired

3.4.4 Marine and Estuarine Shorelines

South of Point Grenville, the nearshore environment in Grays Harbor County is characterized by long stretches of sand beaches with low-lying dunes. North of Point Grenville, the coast is composed of narrow beaches backed by steep cliffs. Beaches in this region are composed of materials from eroding sandstone and siltstone cliffs (Washington Department of Ecology, electronic reference).

The Pacific Coast along Grays Harbor County is part of the Columbia River Littoral Drift Cell. Sediment from the Grays Harbor estuary feeds into and out of the Columbia River littoral cell (CRLC). The CRLC extends from Point Grenville in the North to Tillamook Head in the South and consists of two headlands and three estuaries – Grays Harbor, Willapa Bay, and the Columbia River estuary. The estuaries and headlands divide the CRLC into four sub-cells: Clatsop Plains, Long Beach Peninsula, Grayland Plains, and North Beach. The Grayland Plains flank Grays Harbor to the south and North Beach to the north. North of Point Grenville, the shorelines transition from the wide sandy beaches typical in the south to steeper, narrower beaches characterized by rocky outcrops backed by bluffs.

The primary source of sediment south of Point Grenville is the Columbia River, with minor contributions from the Chehalis River and bluff erosion near Copalis Rock (Gelfenbaum et al. 1999). The direction of sand transport through the CRLC is seasonally driven by wave direction relative to the coast; summer conditions result in a weak southerly long-shore current with little transport capacity and winter conditions result in a strong northerly long-shore current with much greater transport capacity. The Columbia River provides the largest source of sand to the CRLC, which results in the transport of Columbia River sourced sand to Grays Harbor during the winter months via the ebb-tidal deltas and the nearshore zones. Due to the weak southerly summer transport capabilities of the littoral cell, sediment from Grays Harbor primarily remains in the estuary and in the surrounding sub-cells (Gelfenbaum et al. 1999). North of

Point Grenville, outside the CLRC, the steep and rockier beaches also exhibit a trend of net south-to-north sediment transport, though offshore rocks and headlands periodically interrupt this overall trend in localized areas.

The Pacific Coastline is a dynamic system that not only changes seasonally, but also reacts to inter-decadal and inter-centennial cycles and episodic forcing. Inter-decadal cycles include the Pacific Decadal Oscillation; inter-centennial cycles include natural climate variations such as ice ages; episodic influences include the construction of the jetties on both the Columbia River and at Grays Harbor (see Section 3.5.4 for a description of the effects of these jetties).

Tides are of the mixed semi-diurnal type typical of the North American Pacific Coast, typified by two unequal high and low tides per day. The tidal range varies along the length of estuary. The diurnal range at Point Brown in the North Bay is 9.6 feet, the range at Westport is 9.15 feet, and the range at Aberdeen is 10.11 feet. The phase lag at Aberdeen from Westport is approximately 1 hour at high and low tide. The phase lag, amplitude, and range, however, can vary depending on river flow conditions, barometric pressure, wind set-up through the estuary, and wave set-up along the coast (Corps 2014b). Extreme high tides at Aberdeen may reach 13.0 feet above MLLW, due to storm surge in the Pacific Ocean.

Currents in the system are primarily driven by tidal influences, except during very high flow regimes in the Chehalis River. In particular, tidal current modeling in the estuary indicates flows of 4 knots for ebb and 3 knots for flood along the thalweg near Damon Point for low flow conditions in the Chehalis River. Flow speeds diminish landward (east) of the mouth as the estuary opens up (Corps 2014b).

Grays Harbor estuary is 15 miles long and 11 miles wide. The water surface area ranges from 91 square miles at MHHW to 38 square miles at MLLW. The tidal prism is one of the largest in the United States at approximately 5.7×10^8 cubic meters (Corps 2003). The Chehalis is the largest of the tributaries, contributing approximately 80% of the freshwater discharge to the harbor. It drains into the inner harbor at Aberdeen. The largest freshwater flows occur during the winter while the lowest flows occur during the late summer (Corps 2014b). Salinity in Grays Harbor estuary is reasonably well mixed. Salinity intrusion extends approximately up to Montesano during low flow conditions and can be pushed downstream by up to 10 miles from Montesano during high flows in the Chehalis River (USGS 1969). Small estuaries also exist at the mouths of the Quinault River, Copalis River, Raft River, and numerous other creeks that discharge through the beach and directly to the Pacific Ocean.

Shorelines of Grays Harbor County, both open ocean and within Grays Harbor estuary, are vulnerable to tsunami inundation. Tsunamis can occur either from local sources like the

Cascadia Subduction Zone (CSZ) or from far-field sources such as Alaska or Chile. The last known CSZ event to produce significant inundation and run-up in Washington was in the 1700s, for which numerous proxies exist, such as inland marine deposits and records of inundated forests. Given a recurrence interval of 500 to 1000 years for megathrust events on the CSZ, a large near-field tsunami is bound to occur again in the future (Jacoby et al. 1997; Satake et al. 1996). Far-field tsunamis have produced substantial observed run-ups in Grays Harbor, as well. The 1964 Alaska-Aleutian earthquake and tsunami produced run-up at Ocean Shores of 9.7 feet above the local tide level (Preuss and Hebenstreit 1998).

The Washington State Department of Natural Resources worked with the National Tsunami Hazard Mitigation Program and local officials to develop tsunami evacuation maps for the State of Washington. They utilized a modified circulation model, ADCIRC, to model the credible worst-case tsunami from a seismic event on the CSZ, from which the current evacuation zones were derived (Walsh et al. 2000). In addition to the delineation of tsunami evacuation limits for the State, the U.S. Geological Survey and the Washington Military Department Emergency Management Division recently assessed variation in exposure to tsunami hazard of 24 communities along Washington's outer coast. The report finds that Aberdeen faces more risk to tsunami exposure than other communities along the outer coast of Washington (Wood and Soulard 2008).

Historic Changes and Current Conditions

Existing and potential anthropogenic stressors relevant to coastal and estuarine ecosystems include the following: habitat loss, water quality degradation, changes to sediment transport processes, harvest, climate change, and potential development of ocean energy facilities. These issues are described below.

Habitat and Water Quality Changes

Within Grays Harbor, the inner harbor is heavily industrialized with major port facilities, an airport, pulp mills, landfills, sewage treatment plants, and log storage facilities. Grays Harbor provides commercial shipping access to cities and ports up the Chehalis River.

In 1982, Simenstad et al. estimated that about 30 percent of historic estuary area had been lost. The loss of estuarine habitat resulted from fill to build the cities of Aberdeen and Hoquiam and diking and fill elsewhere in the estuary and lower portions of rivers (Smith and Wenger 2001).

Recruitment and abundance of many marine species are affected by changes in estuarine conditions. For example, Dungeness crab recruitment is affected by oceanographic currents, but Dungeness crab are also particularly sensitive to the effects of dredging and estuarine habitat conditions during development. WDFW's recommendations for the conservation of

Dungeness crabs include suggestions to minimize the volume of dredged materials, minimize trench widening, prevent material suspension, and dredge during low tides in intertidal areas and during high tides in subtidal areas (Fisher and Velasquez 2008). Similarly, development that affects eelgrass beds and water quality in the estuary can have a detrimental effect on juvenile Dungeness crab, salmon, and rockfish that use these habitats for development.

Water quality conditions along the Pacific Coast and in Grays Harbor County are particularly relevant to commercial and recreational shellfish harvest and marine fisheries. Shellfish growth can be affected by fine sediment loads and salinity. Pathogens and toxic algal blooms related to water quality from upland uses can present health hazards from shellfish consumption (Anderson et al. 2002).

Water quality problems in Grays Harbor occurred as early as 1928 as a result of waste from pulp mills, municipal sewage discharge, and agricultural runoff (National Research Council 1996). Water quality conditions began to improve in 1990, when the Weyerhaeuser mill reduced the discharge of chemicals into the harbor, and subsequently since the ITT-Rayonier mill ceased operations (Smith and Wenger 2001). In 1992, a TMDL was prepared to address elevated levels of dioxin found in fish tissue in inner Grays Harbor, and recent sampling indicates that contaminant levels fall within water quality standards (Ecology 2012). Inner Grays Harbor is closed to shellfish harvest, but the majority of the outer portion of Grays Harbor is designated as an approved shellfish harvest area (Washington Department of Health, electronic reference) (Figure 3-2). Grays Harbor County has designated approved shellfish harvest areas (including the Pacific Coastline) as Agricultural Lands of Long Term Commercial Significance.

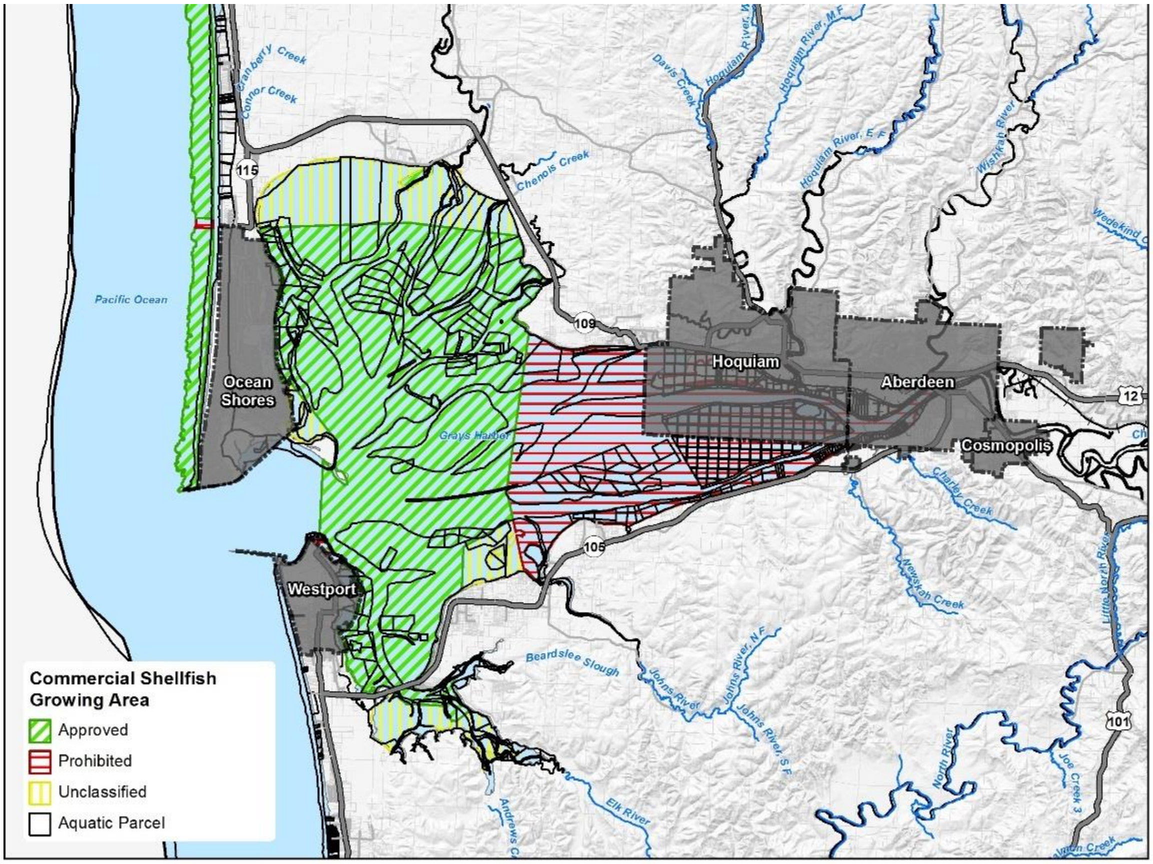


Figure 3-2. Figure showing commercial shellfish growing areas designated by Washington Department of Health

Grays Harbor is included in the Chehalis/Grays Harbor TMDL (Washington Department of Ecology 2004). The Pacific Coast from Point Brown to Point Grenville is used for both recreational and tribal commercial razor clam harvests, and this area is identified as a shellfish harvest area. In 2011, the Washington Department of Health (DOH), Office of Shellfish and Water Protection, reclassified a portion of the Pacific Coast Growing Area near Moclips and Seabrook from Approved to Conditionally Approved. As a result, the County has prepared a Shellfish Protection District Program to identify, monitor, and address water quality concerns on the Pacific Coast (Grays Harbor County 2012).

Waterbodies identified as Category 5 (303(d)) and Category 4(A) (TMDL) in Ecology's 2012 evaluation are identified in Table 3-8.

Table 3-8. Impaired water quality parameters in Grays Harbor and the Pacific Ocean (Source: Ecology 2012).

Waterbody	Parameter	Year of qualifying data	Status
Inner Grays Harbor	Bacteria	1998	TMDL
	Dioxin- tissue	NA	TMDL (Weyerhaeuser 1992)- effective in meeting criterion
Outer Grays Harbor- Sloughs	Bacteria	1997-2008	TMDL
Outer Grays Harbor- Westport	Deildrin- tissue	2008	303(d)- impaired
Drainage Ditch #1	Pesticides	1995-2003	303(d)- impaired
Pacific Ocean (near Moclips and Seabrook)	Bacteria	2007 and 2009	303(d) - impaired

In addition to persistent sources of water quality contaminants described above, ocean-going vessels, particularly those transporting large quantities of oil, present a risk for punctuated water quality impacts from oil spills. Oil spills can result in both short-term mortality, as well as long-term sub-lethal effects (e.g., effects on growth and reproduction) on a variety of sea life (Skewgar and Pearson 2011). Estuarine ecosystems and tidal marshes are particularly vulnerable to the effects of oil spills. Oil requires oxygen to break down, so oil that mixes with mud substrate in areas with lower wave energy may persist in the environment for decades (Skewgar and Pearson 2011).

Changes to Sediment Transport

Dredging in Grays Harbor is primarily conducted for maintenance of the federal navigation channel by the Corps. The deep draft channel extends from the bar offshore of the jetties to Cosmopolis, WA, for approximately 24 miles. On average, 2.5 MCY are dredged annually, including 1.2 MCY from the outer harbor (Corps 2009). Current disposal locations in the estuary include Point Chehalis, the South Jetty, and the Half Moon Bay beneficial use site. There are also open water sites for the disposal of marine sediments (Demirbilek 2010), but these are rarely utilized. The inner harbor sediments (primarily silts/clays) are placed exclusively at the Point Chehalis and South Jetty sites, while the outer harbor sediments (>95% marine sands) are placed at the three estuarine and open-water sites. The Corps plans to deepen the channel from its currently maintained depth of -36 feet MLLW to -38 feet MLLW to facilitate more efficient movement of deep draft ships calling to port at Grays Harbor (Corps 2012). In addition to Corps activities, the Port of Grays Harbor and Weyerhaeuser Twin Harbors Operation conduct frequent maintenance dredging of port facilities, marinas, and private terminals around the bay (DMMO 1999; DMMO 2007).

The entrance to the Grays Harbor Estuary has two jetties, one to the north and one to the south of the entrance. The jetties were constructed between 1898 and 1916. The primary function of a jetty is to constrict flow, increase flow velocities, and promote bed scour in order to mitigate shoaling and keep a channel open. Jetties result in a reduction of dredging requirements for the navigation channel. Following the construction of the jetties at Grays Harbor, the flow speeds through the mouth of Grays Harbor increased, which facilitated the seaward movement of sand in the bay and subsequent trend of shoreline accretion from the early 1920s to the 1950s. Construction of the south and north jetties resulted in accretion of shorelines to the south and to the north. For example, the south Beach (south of South Jetty) had advanced waterward approximately 3,000 feet by 1904. The north Beach (north from the North Jetty) had advanced westward (waterward) approximately two miles by 1957. The "new land" created by shoreline accretion has been subject to intense residential development (Smith and Wenger 2001). In Ocean Shores, extensive leveling and building has substantially altered the natural parallel dune system (Wiedemann 1984).

The rate of accretion, however, has slowed in recent decades, and some shorelines near the entrance were subject to periodic erosion (Buijsman et al. 2003). For example, the shoreline within 2 km north of the North Jetty experienced periodic erosion sometime during 1957, 1975, and from 1995 to 1998. Other times, this shoreline was stable or accreted. At the same time the shorelines further to the north have remained stable or continued to accrete over these periods of time. The shoreline within 1.7 km south of the South Jetty has recently experienced erosion, with erosion rates of 2 to 62 feet per year since 1967. The Corps expects the erosional trend to continue for the foreseeable future for both the North and South Beaches (Corps 2005), but yearly trends are highly variable. Further south, an accretion trend is noted, likely due to the northward migration of Willapa Bay and the resulting supply of sediment to the system (Buijsman et al. 2003). The condition and maintenance of the rock jetties also affects shorelines accretion and erosion trends (Corps 2003).

In the fall of 1996, a so called "wave bumper" structure (two tiered structure composed of rock) was constructed in Ocean Shores near the north jetty to mitigate the loss of shoreline and protect houses located near the shore. These structures are typically covered by sand and serve to dissipate incident wave energy, and in doing so halt the landward advance of the shoreline. More recently, these structures have been exposed by an accelerated pattern of erosion. Further north from the "wave bumper" structure, sand-filled geotextile tubes (geotubes) were constructed in 1997 to mitigate the risk of catastrophic coastal flooding during the 1997-1998 El Nino event. The sand-filled geotube was built along the dune line to protect the sand dune system from eroding and overtopping during extreme storm events. Currently the geotube is covered with sand.

As noted above, the shoreline position in this area north of the north jetty is dynamic and responds to many factors including the deterioration of the north jetty. The retreat or advance of the shoreline in this area is likely caused by the system restoring to pre-jetty conditions and reduced sediment loads coming out of the Columbia River in recent decades.

Harvest

Many marine species are directly targeted for harvest through either recreational or commercial fisheries. Offshore waters are frequently used for recreational bottomfish and lingcod fishing, a commercial Dungeness crab fishery, and a recreational salmon fishery (Washington Marine Spatial Planning, electronic reference). The Pacific Coast and Grays Harbor shorelines support recreational shellfish fisheries, and intertidal beaches within the QIR support a tribal commercial razor clam fishery. In some cases, species that are not directly targeted by fisheries may be indirectly affected through interactions with active or derelict fishing gear, competition for prey, or trophic effects resulting from fishing (Skewgar and Pearson 2011).

Shellfish aquaculture is a significant harvest activity within Grays Harbor. A map of oyster tracts is included in Map 2 of the Inventory Mapfolio (Appendix B).

Shellfish aquaculture can modify estuarine functions through changes resulting from bivalve digestion (filtration and waste), effects on physical structure, and disturbance associated with harvest and chemical treatments (Dumbauld et al. 2009). Detailed reviews of the potential effects of shellfish aquaculture in Washington's estuaries have been conducted by Simenstad and Fresh (1995) and, more recently, by Dumbauld et al. (2009). These effects will be only briefly summarized in the following discussion.

Bivalve filtration affects water properties by reducing the concentration of phytoplankton (Dumbauld et al. 2009). Bivalve waste then results in deposition of fine organic material and the release of dissolved nutrients into porewater or into the water column (Dumbauld et al. 2009).

Bivalve aquaculture tracts within Grays Harbor commonly overlap with areas of mapped eelgrass beds. To the extent that bivalves improve light availability through filtration of phytoplankton and increase nutrient concentrations in sediment, they have the potential to improve eelgrass growth (Dumbauld et al. 2009). However, the physical disturbance associated with aquaculture and space occupied by cultured bivalves could limit eelgrass beds (Dumbauld et al. 2009). A study of the potential impact of oyster aquaculture on eelgrass beds in nearby Willapa Bay found that eelgrass density declined with oyster density in all aquaculture areas; however, eelgrass growth rate, plant size, and production did not change with oyster density (Tallis et al. 2009). A change is eelgrass density was not detectable in long line harvest areas, but eelgrass was smaller and had lower production in these areas (Tallis et al. 2009). Eelgrass growth rates increased in dredged or hand-picked beds, but density, plant size, and production were reduced (Tallis et al. 2009).

Bivalve aquaculture can also interact with invertebrate communities through physical disturbances to the substrate and chemical treatment applications. Another study in Willapa Bay found that the densities of small epibenthic invertebrates were higher in eelgrass beds and oyster beds compared to unstructured mudflat (Hosack and Dumbauld 2006), indicating that the physical structure created by oyster beds may provide habitat functions similar to eelgrass beds. Other studies of shellfish aquaculture in Pacific Coast estuaries have similarly found little to no difference between epibenthic, benthic, and fish assemblages between oyster aquaculture and eelgrass beds (Dumbauld et al. 2009).

Populations of native burrowing shrimp (*Neotrypaea californiensis* and *Upogebia pugettensis*) impact shellfish growing areas by softening the bottom and making areas unsuitable for shellfish beds. Beginning in the 1960s, oyster beds in Grays Harbor have been treated with carbaryl pesticide to control burrowing shrimp populations (Dumbauld et al. 2009). In 2008, Ecology issued a NPDES permit allowing the application of carbaryl pesticide to control burrowing shrimp in shellfish-growing areas within Grays Harbor. That permit expired in 2012, and was not reissued. In early 2014, Ecology began the process of evaluating the potential effects of the use of two other pesticides, imidacloprid and imazamox, to control burrowing shrimp and invasive eelgrass (*Zostera japonica*) in shellfish beds in Willapa Bay and Grays Harbor.

Climate Change

Although the specific impacts of climate change have yet to be fully understood, some of the potential effects include sea level change, ocean acidification, and changes to ocean currents.

Local sea level change can occur as a result of a combination of factors including eustatic change (sea level changes due to changes in the total volume of ocean water or changes in the volumetric capacity of the ocean basins) and local effects such as tectonic uplift. Changes in the world's ocean volume have numerous sources including the melting of ice caps and glaciers and thermal expansion of the oceans due to climate change (Committee et al. 2012). Although long-term sea level rise records are relatively sparse for the region, there is indication that the rate of eustatic sea level rise (SLR) exceeds the rate of tectonic uplift for the central Washington Coast. The nearest long-term tidal station is located to the south at Toke Point, WA, with an estimated mean SLR trend of 0.73 mm/year ± 1.05 mm/year between 1973 and 2012 (NOAA 2014). It is expected that there will be a net rise in the sea level in Grays Harbor County in the future. Mote et al. (2008) developed three alternatives for SLR for the Central Washington Coast that indicate SLR of 1 to 18 inches by 2050 and 2 to 43 inches by 2100. As sea levels rise, shorelines will be exposed to higher water levels and thereby subject to greater potential for erosion.

Another potential effect of climate change relates to ocean acidification. Ocean acidification, resulting from adsorption of atmospheric carbon dioxide (CO_2), reduces pH in marine waters and the availability of carbonate ions that are used for shell formation on marine plankton and shellfish. Since the industrial revolution, the pH of seawater has decreased by approximately 0.1, and reductions of up to 0.4 are predicted from future increases in atmospheric CO_2 (Feely et al. 2008). Ocean acidification results in reduced production and growth of oysters (Barton et al. 2012), and therefore is a concern for native and commercial bivalve species in Grays Harbor and along the Pacific Coast.

Through changes in temperature, climate change stress aquatic and coastal organisms, particularly those at the outer range of their species distributions. This can result in local species extinctions or the shifting of species distributions. Changes in species ranges and depths may alter trophic relationships, as well as fisheries (reviewed in Skewgar and Pearson 2011).

Energy Production

Potential ocean energy projects include projects generating power from waves, tidal currents, and wind.

Studies conducted by the Electric Power Research Institute (EPRI) identify and characterize potential offshore wave energy production sites for the State of Washington as abundant near Grays Harbor. The studies identify the region offshore of Grays Harbor as having relatively high average annual wave power density of 45 kW/m (EPRI 2004). EPRI also indicates that the wave power potential for the entire State is 116 TWh per year for the outer shelf and 72 TWh for the inner shelf (EPRI 2011). There are currently no permitted or pending wave energy projects for Grays Harbor County (FERC 2013). However, the potential exists and may develop further as technologies improve.

The high flow velocities through the navigation channel at the mouth of Grays Harbor during flood and ebb tides point to the potential of the channel to provide tidal power. The Georgia Tech Research Company (GTRC) indicates that Grays Harbor has a total tidal energy production potential of 61 MW with a kinetic power density of 576 W/m^2 (GTRC 2011). Tidal power studies in the nearby Puget Sound, which has very high localized tidal current densities on the order of 5,000 kW-hour/year/ m^2, which translate to 570 W/ m^2, about the same as Grays Harbor. A feasibility study for tidal power in the Puget Sound indicates that there is no current tidal power technology that can provide net positive power production in the Puget Sound (Seattle 2008). Given the tidal power density of Grays Harbor, therefore, tidal power extraction may not provide a net positive power production. There are currently no permitted or pending tidal energy projects for Grays Harbor County (FERC 2013), however, the potential exists and may develop further as technologies improve.

Schwartz et al. (2010) and Musial et al. (2010) have identified viable wind energy resources in the offshore coastal areas of Grays Harbor County. Wind power tends to be highest offshore and decrease as it approaches land (Natural Renewable Energy Laboratory, electronic reference). The highest wind power class occurs closest to shore (approximately one mile) in the southern portion of the County, whereas winds close to shore are less powerful in the northern portion of the County (Natural Renewable Energy Laboratory, electronic reference). Previous planned demonstration projects have not materialized and there are currently no offshore wind projects planned for Grays Harbor County. However, the potential for offshore wind energy exists and may develop further as technologies improve, economic factors are improved, and regulatory roles are clarified (Musial et al. 2010, Baker et al. 2014).

An assessment of the environmental effects of ocean energy noted a number of potential ecological effects of offshore renewable energy developments. These include:

- Temporary disturbance during installation;
- Alteration of currents and waves;
- Alteration of substrates, sediment transport and deposition;
- Alteration of habitats for benthic organisms;
- Acoustic effects of noise during construction and operation,
- Emission of electromagnetic fields;
- Toxicity of paints, lubricants, and antifouling coatings;
- Interference with animal movements and migrations; and
- Alteration of fish and wildlife behavior;
- Direct injury and mortality to fish and wildlife; and
- Potential unforeseen population and community impacts (Polagye et al. 2010).

The same assessment notes that "effects on the magnitude and scale of hydrodynamic and sediment dynamic changes on fish interaction with structure and on changes to community structure are not well understood, especially for marine mammals and seabirds, in such dynamic and difficult-to-study tidal environments" (Polagye et al. 2010). Structures may attract species assemblages by providing structure, either benthic, mid-water or at the water surface, but the extent of the assemblage and the effect of these assemblages on marine populations and communities is not well understood.

4 SHORELINE INVENTORY

4.1 Assessment Units

In order to facilitate the description of shoreline inventory, analysis, and characterization, the County was generally divided into individual Assessment Units (AUs) defined as fifth-order hydrologic units (HUCs). Some modifications were made to combine HUCs (e.g., upper and lower Quinault, Chehalis River). Because of the inherently different processes and functions on marine, estuarine, and freshwater shorelines, Pacific Coast shorelines and estuarine shorelines in Grays Harbor are addressed in separate AUs. Based on this approach, County shorelines were divided into the following 14 AUs, described further in Section 4.3.

1- Queets River
2- Quinault River (Upper and Lower)
3- Moclips/Copalis River
4- Humptulips River
5- Hoquiam River
6- Wishkah River
7- Wynoochee River
8- Satsop River
9- Cloquallum River and Mox Chehalis Creek
10- Chehalis River
11- North River
12- South Grays Harbor Tributaries
13- Pacific Coast
14- Grays Harbor Estuary

The management unit discussions and calculations do not include data for incorporated cities, but they do address unincorporated UGAs.

4.2 Inventory Sources

Development of a shoreline inventory is intended to record the existing or baseline conditions. At a minimum, local jurisdictions shall gather the inventory elements listed in the Guidelines, to the extent that information is relevant and readily available. Collected information principally included watershed and other basin documents, regional studies, scientific literature, aerial photographs, and Geographic Information Systems (GIS) data from a variety of data providers. Table 4-1 lists those relevant inventory elements for which data is available for the County's shorelines. The table also describes the information collected for each of the required inventory elements. Map Figures are provided in the Map Folio (Appendix B), and they depict the various inventory pieces listed in the table, as well as additional analysis. Data gaps and limitations are identified in Section 4.3.

Table 4-1. Shoreline Inventory Elements and Information Sources.

Inventory Element	Spatial Data Gathered	Inventory Map	Data Source	Use/Assumptions/Limitations
Land Use Patterns	• Current land use • Land ownership • Vacant lands	• Map 1 • Map 5 • Map 6	• Grays Harbor County, parcel and assessor data, 2013 • Washington State Parks	• Identifies publicly owned land by agency (e.g., federal, Tribal, State, County) • Identifies in-fee holdings in the QIR • Useful in assessing existing intensity and type of development at broad-scale planning level • Gross scale characterization (e.g., urban, forest, rural/agriculture) • Data may not be up-to-date
	• Comprehensive Plan designations (future land use) • Zoning	• Map 3 • Map 4	• Grays Harbor County Comprehensive Land Use, 2008 • Grays Harbor County Zoning, undated	• Comparison to current use indicates potential changes in intensity and type of development • Useful in planning to accommodate future land use changes at broad-scale planning level • Based on area-wide categorization-includes roads, easements, and utilities • County data does not address lands within the QIR
Public Access Areas	• Parks • Boat Launches • Public Lands • Trails • Beach access	• Map 7	• Grays Harbor County, 2013 • Washington State Parks • Ecology	• Includes established parks and recreation sites • Utility corridors not available. • Tribal usual and accustomed fishing grounds are not mapped.

Inventory Element	Spatial Data Gathered	Inventory Map	Data Source	Use/Assumptions/Limitations
Surface water	Shoreline Watercourses, Lakes, and Marine Shorelines	• Map 1	• US Geological Survey, National Hydrography Dataset, 2013 • Washington Department of Ecology, 2012 • Marine Spatial Planning, 2013	Watercourses that do not meet the definition of Shorelines of the State are not mapped
Surficial Geology	Geologic Units	• Map 12	• WA Department of Natural Resources, Division of Geology and Earth Resources, Surface Geology, June 2010	• Based on broad-scale geologic classifications • Useful for broad scale assessment of geologic conditions (1:100,000-scale) • Not to be used in place of site-specific studies
Soil Taxonomy	Soil order	• Map 13	• ERSI ArcGIS Online, Soil Survey Map (based on USDA NRCS (SSURGO), 2009)	• Useful for broad scale natural resource planning and management • Not to be used in place of site-specific studies • Soils are not mapped within the QIR
Land Cover (vegetation cover, impervious surface	• Terrestrial vegetation community coverage • Percent imperviousness	• Map 8 • Map 9	• Multi-Resolution Land Characteristics (MRLC) Consortium, National Land Cover Database, 2006	• Based on interpretation of multispectral imagery at 30 x 30 meter cell resolution • Agricultural vegetation is frequently mis-categorized as emergent wetland • Useful for broad scale assessment of vegetation coverage and extent of existing development • Not useful for accurate characterization of fine scale data (e.g., city or parcel level, species composition) • May overestimate or underestimate impervious surface coverage • 2006 data may not accurately reflect current conditions

Inventory Element	Spatial Data Gathered	Inventory Map	Data Source	Use/Assumptions/Limitations
Geologically hazardous areas	• Seismic hazard areas • Tsunami Inundation areas	• Map 14	• Washington Department of Natural Resources, Geology and Earth Sciences Division, 2010	• Requires site-specific review to verify presence/absence of geologic hazards • Landslide hazards and steep slopes are not mapped • Although comprehensive mapping of erosion hazard areas was not available, available studies of coastal erosion were referenced in analysis.
Floodplains	• Floodplains • Floodways	• Map 10	• FEMA Preliminary DFRIM data, 2013 (provided by Grays Harbor County)	• Floodplain and floodways based on federal models, and may contain some inaccuracies • Preliminary DFIRM data is not formally adopted by County • Floodplains/Floodways are not mapped in the QIR
Channel Migration Zone	• Channel Migration Zones	• No map	• Data Gap	Requires site-specific review to verify presence/absence of CMZ
Wetlands	• Potential wetlands	• Map 11	• U.S. Fish and Wildlife Service National Wetland Inventory (NWI), 2010	• NWI mapping based on interpretation of multi-spectral imagery • Useful for broad scale assessment of potential wetlands (1:24,000-scale) • Many wetlands are not identified by NWI mapping; mapped wetlands may not meet wetland criteria • Not to be used in place of site-specific studies
Aquifer Recharge Areas	• Principle aquifers • Aquifer recharge area	Map 22	• USGS Principle Aquifers, 2003 • Grays Harbor County, 2013	

Inventory Element	Spatial Data Gathered	Inventory Map	Data Source	Use/Assumptions/Limitations
WDFW Priority Habitats & Species	• Priority fish, priority wildlife, priority habitats	• Maps • 15-17	• WA Department of Fish and Wildlife, 2013	• WDFW maps do not capture every priority species location or habitat, particularly for rare species or species that use shoreline habitats seasonally or intermittently • Absence of mapping information does not indicate absence of a particular species • The number of documented species may reflect the relative amount of past survey efforts • New data will need to be obtained at the time of project application
Shoreline Modifications	• Dams and tidegates • Docks and other overwater structures • Levees • Shoreline armoring • Fish passage barriers	• Map 18	• WA Department of Natural Resources, 2007 • WA Department of Ecology, 2012 • WA Department of Fish and Wildlife, 2013	• Overwater structures may include docks, bridges, floats, structural support fill, and other structures • Data tends to under-represent actual overwater structures in the County • Shoreline armoring data were only available for Grays Harbor and the Pacific Coast • Levees are only mapped within incorporated areas in the County
Water quality impairment	• Category 4 and 5 waters and regulated sites	• Map 19	• WA Department of Ecology, Water Quality Assessment 305(b) Report, 2012	• Water quality impairments are based on monitoring at specific locations • Impairments may extend beyond the mapped area
Restoration opportunities	• Site-specific and general projects	• No map	• TBD	• Data not mapped in shoreline inventory report • Restoration opportunities are not limited to those identified in this report

Inventory Element	Spatial Data Gathered	Inventory Map	Data Source	Use/Assumptions/Limitations
Historical Sites	• Historical properties/places	• Map 21	• WA Department of Archaeology and Historic Preservation, Washington State Heritage Register, 2009	• Only historic properties/places within shoreline jurisdiction are shown on map • Data represent only known sites; additional, presently unknown sites may exist

4.3 Inventory Data Summary, Assumptions, Limitations, and Data Gaps

The following discussion identifies assumptions and limitations for each of the inventory elements, and may provide a brief Countywide or watershed-wide narrative where qualitative descriptions provide more information than quantitative measures. Despite data gaps and limitations, a substantial quantity of information is available for the shorelines of Grays Harbor County to aid in the development of the inventory and analysis report, as well as the SMP update.

4.3.1 Ecological Characterization

Terrestrial Vegetation Coverage

The data were generated using multi-spectral satellite imagery with 30x30-meter cell resolution. Spectral data were classified using Multi-Resolution Land Characteristics (MRLC) Consortium, National Land Cover (NLC) Database. Because each cell represents 900 square meters, the classification may over or under represent coverage when the type of coverage within cells is mixed. The spatial resolution of the NLC data provides a good foundation for broad scale assessment of vegetation coverage. Its utility is higher in rural areas where vegetative cover is more uniform over broad areas compared to more developed UGAs.

Because the data is based on interpretation of multi-spectral imagery, classification of some data may be inaccurate. Most notably, shrub steppe vegetation on steeper slopes is frequently mis-categorized as “cultivated crops” using the NLC model. So long as the inherent inaccuracies of the data are recognized, the NLC data provides a good broad-scale assessment of vegetation coverage.

Finally, because the OHWM changes over time, water is occasionally included within the total shoreline area used for the calculation of vegetation coverage. For this reason, any area identified as “Water” was excluded from the calculation of percent coverage.

Impervious Surfaces

Similar to the vegetation coverage data, impervious surface data were generated using MRLC Consortium NLC data (2006) of multispectral satellite imagery with 30x30-meter cell resolution. National Land Cover categories that apply to areas of higher impervious surface coverage include Developed- Low, Medium, and High Intensity categories. The same limitation as the vegetation coverage data apply to impervious surfaces. With these limitations in mind, a comparison of impervious surface coverage among reaches provides useful information on broad scale spatial trends in development.

Wetlands

Wetland mapping was assembled from the National Wetlands Inventory (date?). Grays Harbor County has not completed a County-wide inventory of potential wetlands and therefore the NWI dataset was used as the most relevant and useful information. The NWI dataset is based on many factors, including soil inventories and aerial interpretations. Although it is very comprehensive and is fairly accurate in approximating wetland locations, it is acknowledged that many wetlands, especially small wetlands, are not identified by NWI. Likewise, some areas identified as NWI wetlands may not meet wetland criteria. Whether or not they are captured by this mapping effort, actual wetland conditions that may or may not be found on a site will determine shoreline jurisdiction (as a potential shoreline associated wetland) on a site-specific basis.

Soils

Soil data are derived from the Natural Resource Conservation Service (NRCS) national soil survey. These data represent soils over broad areas; therefore, site specific soil characteristics may differ from what is mapped. Soils are not mapped within the QIR.

Surficial Geology

Data on surficial geology are based on information from Washington DNR. Information on alluvial soil presence and distribution was used to provide a broad-scale interpretation of hyporheic functions.

Fish and Wildlife Habitat Conservation Areas

WDFW Priority Habitat and Species maps are presented as three separate units: Habitat Regions (species or habitat ranges by area), Habitat Species (precise species locations); and Fish (fish species presence).

These maps do not capture every priority species location or habitat in shoreline jurisdiction, particularly rare species or species that use the water for foraging and drinking, but that nest or den farther from the shoreline. Absence of mapping information does not indicate that a particular species does not or could not utilize the shoreline or adjacent lands. Furthermore, the number of documented species may reflect the relative amount of past survey efforts rather than the presence or absence of suitable habitat.

Frequently Flooded Areas

For all practical purposes, “frequently flooded areas” are those areas within the 100-year floodplain. Floodplain and floodway maps were developed using FEMA’s preliminary dFIRM map for Grays Harbor County. Because the preliminary dFIRM has not been officially adopted, it is subject to change; however, it is expected to represent the best available information. Floodplain mapping is not available within the QIR.

Channel Migration Zone

Existing Channel Migration Zone (CMZ) data were not available for shorelines within Grays Harbor County. The 100-year floodplain may be used as a proxy for the CMZ except where areas are separated from the channel by a legally existing artificial structure.

Geologically Hazardous Areas

Maps of geologically hazardous areas were developed by WDNR. The data primarily focus on seismic and tsunami hazards. Mapped tsunami hazards are based on modeled Cascadia subduction zone earthquakes under moderate-high to high run-up scenarios. Landslide hazard areas are not comprehensively mapped in the County, and spatial data on landslide hazard areas were not identified.

Water Quality

As a requirement of Section 303(d) of the federal Clean Water Act that all waterbodies be "fishable and swimmable," Ecology classifies waterbodies into five categories:

- Category 1: Meets tested standards;
- Category 2: Waters of concern;
- Category 3: No data;
- Category 4: Polluted waters that either have or do not require a TMDL; and
- Category 5: Polluted waters requiring a TMDL.

Individual waterbodies are assigned to particular "beneficial uses" (public water supply; protection for fish, shellfish, and wildlife; recreational, agricultural, industrial, navigational and aesthetic purposes). Waterbodies must meet certain numeric and narrative water quality criteria established to protect each of those established beneficial uses. Waterbodies may provide more than one beneficial use, and may have different levels of compliance with different criteria for those beneficial uses in different segments of the stream or lake. As a result, many waterbodies may be on the 303(d) list for more than one parameter in multiple locations.

As presented in the Water Quality map of Appendix B, only Category 4 and 5 waters are depicted. For more information on specific waterbodies and their water quality classifications, Ecology provides an interactive on-line viewer at the following website: http://apps.ecy.wa.gov/wqawa2008/viewer.htm.

Shoreline Modifications

Shoreline modifications are human-caused alterations to the natural water's edge. The most common types of shoreline modifications include overwater structures and shoreline armoring.

WDNR has digitized piers and other in-water structures such as boatlifts, boathouses, and moorage covers. However, this dataset does not differentiate between each of these various types of overwater structures. Thus, reporting of overwater cover is usually an overstatement when assessing just piers, docks, and floats. Although not technically overwater structures, boat ramps are also reported in the inventory. Many estuarine areas within the County have extensive areas of derelict piles. These piles are not included in the WDNR dataset, and they are not mapped; however, these piles are noted in the characterization of ecological functions where they are visible to aerial imagery.

Levees were mapped based on data from Ecology; however, the only mapped levees occur within incorporated areas of the County. These data do not display the numerous levees associated with agricultural and past and present floodplain mining operations along rivers, especially along the Chehalis River.

Countywide data were not available for shoreline stabilization, including rip rap armoring and dikes. WDNRs' shorezone dataset maps armored areas in estuarine and marine waters, but armoring data were not available for freshwater shorelines.

Aquifer Recharge Areas

GIS data on aquifer recharge areas were not available, and this represents a data gap.

4.3.2 Land Use Characterization

This shoreline inventory reviews current and planned land use within shoreline jurisdiction to provide a basis to establish a compatible use pattern over the 20-year planning period of the SMP and to identify current or planned preferred uses in shoreline jurisdiction that should be protected or promoted to meet SMA goals for water-oriented uses, shoreline access, and ecological protection.

The SMA promotes the following use preferences (RCW 90.58.020) for shorelines of statewide significance (identified in Section 1.2) in the stated order:

- Recognize and protect the statewide interest over local interest;
- Preserve the natural character of the shoreline;
- Result in long term over short term benefit;
- Protect the resources and ecology of the shoreline;

- Increase public access to publicly owned areas of the shorelines;
- Increase recreational opportunities for the public in the shoreline; and
- Provide for any other element as defined in RCW 90.58.100 deemed appropriate or necessary.

In addition, the following use preferences apply within shoreline jurisdiction in the following order [from WAC 173-26-201(2)(d)]:

1. Reserve appropriate areas for protecting and restoring ecological functions to control pollution and prevent damage to the natural environment and public health. In reserving areas, local governments should consider areas that are ecologically intact from the uplands through the aquatic zone of the area, aquatic areas that adjoin permanently protected uplands, and tidelands in public ownership. Local governments should ensure that these areas are reserved consistent with constitutional limits.

2. Reserve shoreline areas for water-dependent and associated water-related uses. Harbor areas, established pursuant to Article XV of the State Constitution, and other areas that have reasonable commercial navigational accessibility and necessary support facilities, such as transportation and utilities, should be reserved for water-dependent and water-related uses that are associated with commercial navigation unless the local governments can demonstrate that adequate shoreline is reserved for future water-dependent and water-related uses and unless protection of the existing natural resource values of such areas preclude such uses. Local governments may prepare master program provisions to allow mixed-use developments that include and support water-dependent uses and address specific conditions that affect water-dependent uses.

3. Reserve shoreline areas for other water-related and water-enjoyment uses that are compatible with ecological protection and restoration objectives.

4. Locate single-family residential uses where they are appropriate and can be developed without significant impact to ecological functions or displacement of water-dependent uses.

5. Limit non-water-oriented uses to those locations where the above described uses are inappropriate or where non-water-oriented uses demonstrably contribute to the objectives of the Shoreline Management Act.

Current Land Use

Existing land use provides a baseline for types of land use and land cover found within shoreline jurisdiction. Existing land use data was obtained from the Grays Harbor County Assessor, and then overlaid on Folio maps for land ownership patterns, and aerial images. Mapped assessor use types were sorted into land use categories adapted from those established in WAC 458-53-030. Land use data from the County Assessor's office may not be updated as frequently as other property information; however, it represents the best readily available information on current land use at a countywide level.

Zoning and Comprehensive Plan

Current zoning and comprehensive plan designations provide information on what type of uses can be expected in shoreline areas. Zoning and comprehensive plan data were not available for the shoreline areas within the Quinault and Chehalis Indian Reservations. Similarly, County zoning data does not cover areas in the Olympic National Forest.

Water Oriented Use

According to Ecology's SMP Guidelines (WAC173-26-020), "water-oriented use means a use that is water-dependent, water-related, or water-enjoyment, or a combination of such uses." The Shoreline Management Act promotes uses that are "unique to or dependent upon use of the State's shoreline," as well as "ports, shoreline recreational uses including but not limited to parks, marinas, piers, and other improvements facilitating public access to Shorelines of the State, industrial and commercial developments which are particularly dependent on their location on or use of the Shorelines of the State and other development that will provide an opportunity for substantial numbers of the people to enjoy the Shorelines of the State." (RCW 90.58.020)

Definitions and examples of water-oriented uses are included in Table 4-2 below.

Table 4-2. Water-Oriented Uses Definitions and Examples.

Water-Oriented Use Definitions	Examples
"Water-dependent use" means a use or portion of a use which cannot exist in a location that is not adjacent to the water and which is dependent on the water by reason of the intrinsic nature of its operations. (WAC 173-26-020(39))	Examples of water-dependent uses may include ship cargo terminal loading areas, ferry and passenger terminals, barge loading facilities, ship building and dry docking, marinas, aquaculture, and sewer outfalls.
"Water-related use" means a use or portion of a use which is not intrinsically dependent on a waterfront location but whose economic viability is dependent upon a waterfront location because: (a) The use has a functional requirement for a waterfront location such as the arrival or shipment of materials by water or the need for large quantities of water; or	Examples of water-related uses may include warehousing of goods transported by water, seafood processing plants, hydroelectric generating plants, gravel storage when transported by barge, oil refineries where transport is by tanker, log storage, and potentially agriculture and

Water-Oriented Use Definitions	Examples
(b) The use provides a necessary service supportive of the water-dependent uses and the proximity of the use to its customers makes its services less expensive and/or more convenient. (WAC 173-26-020(43))	agriculturally related water transportation systems.
"Water-enjoyment use" means a recreational use or other use that facilitates public access to the shoreline as a primary characteristic of the use; or a use that provides for recreational use or aesthetic enjoyment of the shoreline for a substantial number of people as a general characteristic of the use and which through location, design, and operation ensures the public's ability to enjoy the physical and aesthetic qualities of the shoreline. In order to qualify as a water-enjoyment use, the use must be open to the general public and the shoreline-oriented space within the project must be devoted to the specific aspects of the use that fosters shoreline enjoyment. (WAC 173-26-020(40))	Primary water-enjoyment uses may include, but are not limited to, parks, piers and other improvements facilitating public access to the Shorelines of the State; and general water-enjoyment uses may include, but are not limited to restaurants, museums, aquariums, scientific/ecological reserves, and resorts/hotels (as part of mixed-use development or with significant public access or restoration components), and commercial/office as part of a mixed-use development.

Transportation and Utility Infrastructure

There are several County, State, and federal highway road sections and railroad corridors in Grays Harbor County that either parallel, cross or are otherwise located in existing or future shoreline jurisdiction.

Utility infrastructure such as water, wastewater, electrical, communication, and other facilities are found throughout the County with a higher prevalence in populated areas of the County. Spatial data describing much of the County's utility infrastructure was not available, and is not included in inventory maps.

A description of available transportation and utility infrastructure in the shorelines is found in Chapter 6.

Existing and Potential Public Access

Information about Grays Harbor County shoreline public access facilities and potential opportunities was obtained from a review of federal, State, County, and local parks data, federal and state lands, and public access points. In addition to lands identified as public parks or lands managed specifically for public access, there are several areas identified as conservation easements or protected lands. These lands are generally managed for preservation of ecological systems or restoration efforts. In many cases, public access is not a use explicitly identified by the owner, but recreational uses are allowed or occur informally. These lands are identified under a subheading for each AU. It is also important to note that there are shoreline areas of Grays Harbor County that are undeveloped and used for public access, but are not identified in an available dataset. Many of these areas are remote or accessed by boat. This report acknowledges that these area occur, but cannot be specifically identified. The analysis of public access does not account for public access (either physical or visual) from private lands (e.g., community clubs, restaurants, and hotels). Public road ends may also provide shoreline access, and these are not identified in the inventory maps.

Historical or Archaeological Sites

Given the tribal presence in the County over several thousand years and the use of shorelines for sustenance and spiritual practices, archaeological features are expected to be present, particularly in river valleys and around Grays Harbor. Recognized historical sites are mapped; however, details on these sites are often limited. Due to the wealth of cultural resources, the State of Washington Department of Archaeology and Historic Preservation requires cultural resources assessments when development or activities are proposed that may affect archaeological or historic resources.

4.4 Assessment Unit Inventory Conditions

Table 4-3 expands upon the relevant required inventory elements, providing specific detail and data for each management unit. Unless otherwise noted, Table 4-3 considers only information available within the boundaries of shoreline jurisdiction of each management unit.

Table 4-3. Summary of Shoreline Inventory by Management Unit.

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
1-Queets (557 acres)				
Current Land Use • Unknown ....79% • Vacant/Undeveloped............19.5% • Forestry ....1.5% **Comprehensive Plan** • General Development ....100% **Zoning** • Not Zoned 100%	**Vegetation** • Evergreen Forest....................53% • Woody Wetlands.....................24% • Shrub/Scrub..............................5% • Herbaceous ....4% • Mixed Forest.............................3% • Deciduous Forest......................3% • Emergent Herbaceous Wetlands..................................2% **Developed Land** • Developed, Open Space 0.35%	• Floodplain .... 0% • Floodway.......... 0%	• Federal Lands .... 12.3% • 1 National Forest • All other Shoreline access for QIN members only	• Wetlands . 33.1%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
2-Quinault (10,297 acres)				
Current Land Use • Unknown .... 43.5% • Vacant/Undeveloped............. 37% • Forestry .... 16.6% • Residential .... 2.8% **Comprehensive Plan** • General Development ....80.2% • Lake Quinault ....16.6% • Recreational/Residential ....3.1% **Zoning** • Not Zoned ....74.3% • Residential (Lake Quinault)..21.8% • General Development 5 ....3.9%	**Vegetation** • Woody Wetlands....................41% • Evergreen Forest ....38% • Shrub/Scrub.............................5% • Mixed Forest ....3% • Deciduous Forest.....................2% **Developed Land** • Developed, Open Space .....2.06% • Developed, Low Intensity ....0.26% • Developed, Medium Intensity 0.05%	• Floodplain ..... 0.7% • Floodway.......... 0%	• Federal Lands .... 27.5% • 2 Boat Launches • 2 Campgrounds • 1 National Forest • 1 National Park • Shoreline access on QIR for QIN members only	• Wetlands . 32.3%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
3-Moclips/ Copalis (3,361 acres)				
Current Land Use • Forestry ....47.1% • Vacant/Undeveloped............37.3% • Unknown ....10% • Residential ....3.2% • Recreation.................................2% **Comprehensive Plan** • General Development ....74.1% • Recreational/Residential ......25.9% **Zoning** • General Development 5 ....45.4% • Residential (Resort) ....21.3% • Not Zoned ....16.7% • Commercial (General)..........16.6%	**Vegetation** • Evergreen Forest....................48% • Woody Wetlands.....................33% • Emergent Herbaceous Wetlands...................................6% • Scrub/Shrub..............................5% **Developed Land** • Developed, Open Space .....2.41% • Developed, Low Intensity ....1.56% • Developed, Medium Intensity 0.13%	• Floodplain ... 46.5% • Floodway.......... 0%	• Federal Lands .... 0% 2 Beach access points • 1 State Park • 1 County Park	• Wetlands 20.1%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas-Wetlands
4-Humptulips (8,426 acres)				
Current Land Use • Forestry ....52% • Vacant/Undeveloped............29.1% • Unknown ....15.3% • Residential ....3% **Comprehensive Plan** • General Development ....54.5% • Agriculture ....30.8% • Lake Quinault ....10.4% • Urbanizing ....4.3% **Zoning** • General Development 5 ....61.5% • Not Zoned ....23.2% • Residential (Lake Quinault)..11.8% • Agriculture1 ....2% • Commercial (General)...........1.5%	**Vegetation** • Evergreen Forest....................46% • Woody Wetlands....................34% • Shrub/Scrub....................5% • Mixed Forest....................3% • Emergent Herbaceous Wetlands....................3% • Deciduous Forest....................2% **Developed Land** • Developed, Open Space .....2.31% • Developed, Low Intensity ....0.41% • Developed, Medium Intensity 0.03%	• Floodplain ... 53.4% • Floodway.......... 0%	• Federal Lands... ....29.5% • 1 National Forest • 7 Boat launches • 1 WDFW Unit	• Wetlands 32.2%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
5-Hoquiam (2,945 acres)				
Current Land Use • Vacant/Undeveloped............51.8% • Forestry................................34.9% • Residential ....11.3% **Comprehensive Plan** • General Development ....83.5% • Urbanizing ....16.5% **Zoning** • General Development 5 ....68.3% • Not Zoned ....11% • Industrial................................8.4% • Industrial Park ....7.2% • Residential (General) ....2.6% • Commercial (General)............2.6%	**Vegetation** • Woody Wetlands.....................58% • Evergreen Forest....................24% • Shrub/Scrub..............................3% • Emergent Herbaceous Wetlands ....3% • Mixed Forest.............................2% • Deciduous Forest......................2% **Developed Land** • Developed, Open Space .....3.73% • Developed, Low Intensity ....2.01% • Developed, Medium Intensity ....0.35% • Developed, High Intensity....0.19%	• Floodplain ... 83.9% • Floodway.......... 0%	• Federal Lands .... 0% • 1 Boat Launch	• Wetlands 48.0%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
6-Wishkah (4,153 acres)				
Current Land Use • Forestry .... 74.5% • Vacant/Undeveloped .... 14.8% • Residential .... 7.3% • Not Coded .... 1.9% • Agriculture .... 1.1% **Comprehensive Plan** • General Development .... 64.6% • Agriculture .... 25.5% • Urbanizing .... 9.8% **Zoning** • General Development 5 .... 53.4% • Agriculture 1 .... 27.5% • Not Zoned .... 10.8% • Residential (General) .... 3.3% • Residential (Restricted) .... 3.3% • Commercial (General) 1.6%	**Vegetation** • Woody Wetlands..................... 51% • Evergreen Forest .... 23% • Shrub/Scrub .... 7% • Emergent Herbaceous Wetlands .... 6% • Mixed Forest .... 3% • Deciduous Forest .... 3% **Developed Land** • Developed, Open Space ..... 2.17% • Developed, Low Intensity 0.78%	• Floodplain ... 60.2% • Floodway 0%	• Federal Lands .... 0% • 1 Boat Launch • 1 Conservation easement • 1 WDFW unit	• Wetlands 36.6%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
7- Wynoochee (6,098 acres)				
Current Land Use • Forestry ....45.6% • Unknown ....23.5% • Vacant/Undeveloped............13.1% • Agriculture ....8.6% • Residential ....6.5% • Recreation ....1.2% **Comprehensive Plan** • General Development ....70.1% • Agriculture II ....28.7% • Rural Residential....................1.2% **Zoning** • General Development 5 ....30.7% • Agriculture 2 ....25.1% • Not Zoned ....17.9% • Agriculture 1 ....16.5% • Residential (General) ....2.5% • Rural Residential....................2.5% • Commercial (General)............1.6% • General Development 1 ....1.6% • Industrial................................1.6%	**Vegetation** • Evergreen Forest....................39% • Woody Wetlands....................28% • Emergent Herbaceous Wetlands ....8% • Shrub/Scrub.............................7% • Hay/Pasture ....5% • Mixed Forest.............................3% • Herbaceous ....2% • Deciduous Forest......................2% **Developed Land** • Developed, Open Space .....3.52% • Developed, Low Intensity ....0.90% • Developed, Medium Intensity ....0.13% • Developed, High Intensity....0.01%	• Floodplain ... 47.3% • Floodway....... 4.2%	• Federal Lands... ....30.0% • 3 Boat Launches • 1 National forest • 1 Picnic ground • 1 WDFW unit	• Wetlands 30.7%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
8-Satsop (6,029 acres)				
Current Land Use • Forestry ....54.6% • Agriculture ....19.6% • Vacant/Undeveloped............10.2% • Unknown ....8.2% • Residential ....6.8% **Comprehensive Plan** • General Development ....49.1% • Agriculture II ....41.6% • Agriculture I ....8.3% **Zoning** • General Development 5 ....39.4% • Agriculture 2 ....37.1% • Satsop Multi-Use..................10.8% • General Development 1 ....5.4% • Agriculture 1 ....5.4% • Not Zoned 1.9%	**Vegetation** • Evergreen Forest ....32% • Woody Wetlands.....................28% • Shrub/Scrub ....10% • Hay/Pasture ....9% • Emergent Herbaceous Wetlands ....7% • Herbaceous ....4% • Mixed Forest ....3% **Developed Land** • Developed, Open Space .....2.39% • Developed, Low Intensity ....1.27% • Developed, Medium Intensity ....0.03% • Developed, High Intensity....0.01%	• Floodplain ... 64.1% • Floodway..... 20.1%	• Federal Lands... .... 7.7% • 1 Boat Launch • 1 National Park • 1 State Park • 1 WDFW Unit	• Wetlands ... 25%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
9-Cloquallum (1,838 acres)				
Current Land Use • Forestry .... 38.1% • Residential .... 36.4% • Vacant/Undeveloped........... 19.8% • Agriculture .... 2.4% • Manufacturing/Industrial........ 2.2% **Comprehensive Plan** • General Development .... 66.8% • Agriculture I .... 17.8% • Rural Residential................. 11.3% • Urban Services...................... 2.1% • Agriculture II .... 1.9% **Zoning** • General Development 5 ...... 39.3% • Rural Residential.................... 20% • Agriculture 1 .... 11.4% • Industrial.............................. 10.6% • Not Zoned .... 5.9% • Agriculture 2 .... 5.7% • Residential (General) 4.1%	**Vegetation** • Woody Wetlands.....................35% • Evergreen Forest....................13% • Hay/Pasture ....6% • Shrub/Scrub.............................6% • Emergent Herbaceous Wetlands 6% • Herbaceous ....5% • Mixed Forest.............................5% • Deciduous Forest......................3% **Developed Land** • Developed, Open Space ...13.92% • Developed, Low Intensity ....6.22% • Developed, Medium Intensity 1.59%	• Floodplain ... 56.1% • Floodway....... 8.4%	• Federal Lands 0%	• Wetlands .. 9.2%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
10- Chehalis (12,988 acres)				
Current Land Use • Vacant/Undeveloped............57.8% • Forestry................................20.2% • Agriculture............................12.4% • Residential ....6.5% • Manufacturing/Industrial.........1.9% **Comprehensive Plan** • Agriculture II.........................36.7% • Industrial...............................34.9% • General Development..........24.6% • Urbanizing..............................1.6% **Zoning** • Industrial...............................20.3% • General Development 5.......18.5% • Commercial (General)..........18.1% • Agriculture 2.........................14.0% • Residential (General)...........12.1% • Not Zoned ....7.5% • Residential (Restricted).............6% • Satsop Multi-Use....................1.7%	**Vegetation** • Woody Wetlands.....................59% • Emergent Herbaceous Wetlands 9% • Hay/Pasture..............................5% • Evergreen Forest......................4% • Deciduous Forest......................2% • Shrub/Scrub..............................2% • Mixed Forest.............................2% **Developed Land** • Developed, Open Space .....2.92% • Developed, Low Intensity ....0.90% • Developed, Medium Intensity ....0.15% • Developed, High Intensity....0.01%	• Floodplain ... 84.1% • Floodway....... 0.1%	• Federal Lands.. .... 8.2% • 5 Boat Launches • 3 Campgrounds • 3 State Forests • 3 County Park • 1 DNR NAP • 1 Land Trust Property • 4 WDFW Units	• Wetlands 64.2%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
11-North River (5,210 acres)				
Current Land Use • Forestry ....83.6% • Vacant/Undeveloped.................8% • Residential ....6.7% • Agriculture ....1.4% **Comprehensive Plan** • General Development ....81.9% • Agriculture 1 ....18.1% **Zoning** • General Development 5 ....50.7% • Agriculture 2 ....49.3%	**Vegetation** • Woody Wetlands.....................45% • Evergreen Forest ....34% • Shrub/Scrub..............................6% • Herbaceous ....4% • Deciduous Forest......................2% • Mixed Forest ....2% **Developed Land** • Developed, Open Space .....3.72% • Developed, Low Intensity 0.62%	• Floodplain ... 56.6% • Floodway.......... 0%	• Federal Lands 0%	• Wetlands 19.2%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
12-South Grays Harbor (2,582 acres)				
Current Land Use • Forestry ....52.7% • Vacant/Undeveloped....36.8% • Agriculture ....7.7% • Residential ....2.5% **Comprehensive Plan** • General Development ....74.8% • Urbanizing ....15.7% • Industrial....9.5% **Zoning** • General Development 5 ....55.7% • Industrial....27.2% • Not Zoned ....9.1% • Residential (General) 8%	**Vegetation** • Woody Wetlands....43% • Evergreen Forest ....28% • Emergent Herbaceous Wetlands....17% • Shrub/Scrub....3% **Developed Land** • Developed, Open Space ....5.23% • Developed, Low Intensity ....0.97% • Developed, Medium Intensity 0.01%	• Floodplain ... 67.4% • Floodway.... 0%	• Federal Lands .... 0% • 1 Boat Launch • 1 Wildlife Area • 1 NRCA Area	• Wetlands ... 59%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas- Wetlands
13-Pacific Coast (1,249 acres)				
Current Land Use • Vacant/Undeveloped...............46% • Unknown ....29% • Residential ....13% • Recreation.............................7.6% **Comprehensive Plan** • General Development ....50.5% • Recreation-Residential.........49.5% **Zoning** • Residential Resort................43.1% • Not Zoned ....29.7% • Commercial (General)..........22.4% • General Development 5 ....3.4% • Residential (General) 1.4%	**Vegetation** • Herbaceous ....25% • Evergreen Forest....................19% • Emergent Herbaceous Wetlands................................11% • Woody Wetlands.......................8% • Shrub/Scrub..............................4% • Deciduous Forest......................2% **Developed Land** • Developed, Low Intensity ....3.30% • Developed, Open Space .....1.57% • Developed, Medium Intensity ....0.32% • Developed, High Intensity....0.09%	• Floodplain ... 58.1% • Floodway.......... 0%	• Federal Lands .... 0.0% • Beach Access for QIN • 1 Private Preserve • 1 County Park • 4 State Parks • 9 Beach Access Points	• Wetlands ... 25%

Land Use Patterns	Land Cover	Floodplain, Floodway	OpenSpace/ Parks	Critical Areas-Wetlands
14-Grays Harbor Estuary (4,127 acres)				
Current Land Use • Vacant/Undeveloped............65.7% • Forestry................................20.7% • Residential ....9.8% • Manufacturing/Industrial.........2.4% **Comprehensive Plan** • General Development ....39.7% • Agriculture ....24.2% • Recreation-Residential.........18.8% • Urbanizing ....10.1% • Industrial................................7.2% **Zoning** • General Development 5 ....37.8% • Residential Resort...................27% • Agriculture 1 ....12.1% • Industrial................................8.1% • Residential (General) ....5.7% • Commercial (General)............5.3% • Not Zoned 3.6%	**Vegetation** • Woody Wetlands.....................38% • Emergent Herbaceous Wetlands 26% • Evergreen Forest....................22% • Herbaceous ....2% **Developed Land** • Developed, Open Space .....3.28% • Developed, Low Intensity ....1.13% • Developed, Medium Intensity ....0.03% • Developed, High Intensity....0.01%	• Floodplain ... 55.9% • Floodway.......... 0%	• Federal Lands .... 0.0% • 1 State Parks • 4 DNR NAPs • 1 DNR NRCA • 4 Beach Access Points • 4 WDFW Units • 2 Land Trust Property • 1 Private Preserve • 1 Recreation Center	• Wetlands 81.2%

[1] Based on NLCD 2006, where Developed Open Space: <20 percent impervious surface coverage, Developed Low Intensity: 20-49 percent impervious surface coverage; Developed Medium Intensity: 50-79 percent impervious surface coverage; Developed High Intensity: over 80 percent impervious surface coverage.

5 ANALYSIS OF ECOLOGICAL FUNCTIONS

5.1 Methods

5.1.1 Reach Delineation

The 14 Assessment Units (AUs) within the County were broken into discrete reaches based on a review of maps and aerial photography. These reaches were used to describe and analyze shoreline areas with generally similar ecological and land use characteristics. Shoreline reaches do not entail any regulatory boundaries for the future SMP.

The criteria in Table 5-1 were used to determine reach break locations for marine, riverine, estuarine, and lacustrine shorelines. Land use (e.g., adjacent land use patterns, shoreline uses, ownership, zoning, comprehensive plan designation, and shoreline modifications) was weighted heavily in determining reach break locations in recognition that the intensity and type of land use will affect shoreline ecological conditions. Furthermore, functional analysis outcomes will be more relevant for future determination of appropriate shoreline environment designations if the reach breaks occur at land use transition points. In addition to land use, physical drivers of shoreline processes were used to establish an overall framework for determining reach break locations.

Table 5-1. Criteria for Determining Reach Breaks

Factors weighed in determining reach break location	Marine/Estuarine	Riverine	Lacustrine
1	Changes in land use[1]	Changes in land use[1]	Changes in land use[1]
2	Change in shoretype	Changes in vegetation (coverage and type)	Stream/River confluences
3	Changes in vegetation (coverage and type)	Changes in channel confinement and upland topography	Significant wetland areas[2]
4	Creek/River mouths	Tributary confluences	Changes in topography
5			Changes in vegetation (coverage and type)

1. Reach breaks were generally identified at the nearest parcel boundary, except with large parcels, where physical or ecological factors changed notably within a single parcel.
2. In general, reach breaks were positioned to avoid dividing large wetlands.

Each reach was given a unique identifier to signify the waterbody name, reach number along that waterbody (beginning with #1 at the mouth, and increasing upstream). The total number of reach breaks by management unit is described in Table 5-2. Detailed maps of reach breaks throughout the County are provided in Appendix B, and summary graphics for each AU are provided in Section 5.2.

Table 5-2. Summary of Reaches per Management Unit

Management Unit	Number of Reaches
Queets River	3
Quinault River (Upper and Lower)	44
Moclips/Copalis River	15
Humptulips River	26
Hoquiam River	11
Wishkah River	11
Wynoochee River	26
Satsop River	16
Cloquallum River	18
Chehalis River	51
North River	12
South Grays Harbor Tributaries	11
Pacific Coast	10
Grays Harbor Estuarine Shorelines	19

5.1.2 Functions and Impairments

The analysis of reach functions was based on the four major function categories identified in Ecology's guidelines: hydrologic, hyporheic, shoreline vegetation, and habitat. The four primary functional categories were further broken down into relevant functions identified in WAC 173-26-201(3)(d)(i). Table 5-3 provides a brief description of each function, potential effects of land use, and potential indicators for each function from available spatial data.

Table 5-3. Summary of Shoreline Ecological Functions, Effects of Land Use, and Available Indicators

	Processes	Shoreline Type	Functions, Impacts, and Indicators
Hydrologic	**Water and sediment processes**	Riverine	Storage of peak flows is provided by floodplains, off channel areas and large wetland complexes; these features help reduce peak flows and contribute to summer low flows. Whereas landslides and bank failures typically contribute sediment in steep upper reaches; overbank flooding, localized bank erosion, and bedload transport represent the major sediment transport processes in lower reaches. ***Land use impacts:*** Vegetation removal alters the water/sediment balance and destabilizes slopes resulting in excess bed or bank erosion and disconnected floodplains. Encroachment into floodplains and floodways by structures or fill reduces the local flood storage capacity, resulting in increased flood heights and velocities. Shoreline armoring limits local bank erosion. Roads can acceslearate erosion, particularly in steep terrain. Dams affect hydrologic processes at a watershed scale. ***Available Data Indicators:*** Floodplains, Floodways, Road density, Dams, Wetlands *Other indicators (not available)*: Armoring
		Lacustrine	Water storage functions of lakes can help attenuate the severity of downstream flooding. Sediment storage functions alter downstream sediment budgets. ***Land use impacts:*** Artificial dams alter the seasonal storage of water and limit sediment transport downstream. ***Available Data Indicators:*** Dams *Other indicators (not available)*: Armoring
		Marine/ Estuarine	Coastal marshes, beaches, tide flats, and estuarlies help buffer the shoreline from erosion. Sediment transport processes are affected by freshwater inputs, tides, waves, and wind. Sediment accretion is responsible for the formation of estuarine and marine habitats including salt marshes and sand dunes. ***Land use impacts:*** In-water structures and shoreline armoring alter sediment transport processes. Dikes restrict tidal exchange and tidegates result in muted exchange. Development can affect groundwater recharge rates by concentrating and channelizing stormwater and filling wetlands. Dikes restrict tidal exchange and tidegates result in muted exchange. ***Available Data Indicators:*** Armoring, Dikes, *Other indicators (comprehensive data not available):* Tidegates

	Processes	Shoreline Type	Functions, Impacts, and Indicators
Hydrologic	**Energy attenuation**	Riverine	Floodway and floodplain areas and riverine wetlands provide a transition between upland and riverine habitats. Vegetated uplands help to desynchronize flooding impacts downstream. Broad, vegetated floodplains help slow and disperse flood flows. ***Land use impacts:*** Armored or leveed shorelines tend to accelerate flow, increasing erosional forces downstream. ***Available Data Indicators:*** Floodplains, Floodways, Forested vegetation in floodplain, Levees *Other indicators (not available):* Armoring
		Lacustrine	Shallow gradient shorelines help attenuate wave energy, limiting shoreline erosion and providing sheltered, shallow-water habitat. Emergent and woody vegetation helps attenuate wave energy. ***Land use impacts:*** Armored shorelines create a steep shoreline gradient, and tend to reflect wave energy toward adjacent shoreline areas or the lake bed. ***Available Data Indicators:*** Riparian vegetation *Other indicators (not available):* Armoring
		Marine/ Estuarine	Intertidal and shoreline habitats, such as salt marshes, eelgrass beds, natural beaches, and sand dunes attenuate wave and tidal energy. ***Land use impacts:*** Diking and/or fill of wetlands limits attenuation. Armored shorelines tend to reflect wave energy toward adjacent shoreline areas or the toe of armoring. ***Available Data Indicators:*** In-water structures, Armoring, Dikes, Wetlands, Eelgrass beds
	Developing pools, riffles, and gravel bars	Riverine	A balanced sediment budget helps to maintain complex channel form and connected floodplains. LWD transported downstream helps develop and maintain instream habitat complexity. Channel migration contributes to a diversity of floodplain habitats and is a significant factor involved in large wood recruitment in large river systems. ***Land use impacts:*** Removal of forested vegetation and/or LWD limits sediment storage, cover, and habitat complexity. ***Available Data Indicators:*** Floodplains, Floodways, Forested vegetation in floodplain

	Processes	Shoreline Type	Functions, Impacts, and Indicators
Hydrologic	**Recruitment and transport of LWD and organic material**	Riverine	Periodic flooding and channel migration processes result in the recruitment of LWD into the river channel, which in turn redirects stream flows to shape the channel form and influences sediment storage, transport, and deposition rates. Floodplain vegetation also provides a significant source of detritus and primary and secondary production, which enters the channel during flood pulses. ***Land use impacts:*** Removal of forested riparian vegetation or LWD limits these functions. ***Available Data Indicators:*** Floodplains, Floodways, Forested vegetation in floodplain
		Marine/ Estuarine	The periodic tidal inundation of intertidal salt marshes results in significant export of organic detritus. Hydrologic processes in the marine environment result in the accumulation of beach wrack, which supports macroinvertebrates and provides foraging opportunities for shorebirds. ***Land use impacts:*** Diking and/or wetland fill limits detrital connectivity. ***Available Data Indicators:*** Armoring, Dikes, Wetlands
	Removing excess nutrients and toxic compounds	Riverine	Floodplain and riparian wetland habitats contribute to nutrient and contaminant filtration. ***Land use impacts:*** Fill or isolation of wetlands limits functions. Development increases nutrient and contaminant loads. Failing septic systems and direct wastewater outfalls can directly affect water quality. ***Available Data Indicators:*** Impervious surfaces, Wetlands, Wastewater outfalls, *Other indicators (not available):* Septic mapping, stormwater outfalls
		Lacustrine	Lake-fringe wetland habitats contribute to nutrient and contaminant filtration. ***Land use impacts (Lacustrine):*** Fill or isolation of wetlands limits functions. Development increases nutrient and contaminant loads. Failing septic systems and direct wastewater outfalls can directly affect water quality. ***Available Data Indicators:*** Impervious surfaces, Wetlands, Wastewater outfalls *Other indicators (not available):* Septic mapping, stormwater outfalls

	Processes	Shoreline Type	Functions, Impacts, and Indicators
		Marine/ Estuarine	Periodic tidal inundation of tidal marshes results in nutrient and contaminant uptake. ***Land use impacts:*** Fill or isolation of tidal marshes limits functions. Development increases nutrient and contaminant loads. Failing septic systems and direct wastewater outfalls can directly affect water quality. ***Available Data Indicators*:** Dikes, Wetlands, Wastewater outfalls *Other indicators (not available):* Septic mapping, stormwater outfalls
Hyporheic	**Removing excess nutrients and toxic compounds**	Riverine only	Nutrients and toxic compounds may be filtered or removed by uptake in shallow alluvial soils. ***Land use impacts:*** Removal of LWD and changes to hydrology that alter channel complexity may limit hyporheic functions. ***Available Data Indicators:*** Alluvial soils
	Water and sediment storage		Hyporheic flow provides an important source of cool water refugia. ***Land use impacts:*** Removal of LWD, mining, and other changes that simplify channel form may limit hyporheic functions. ***Available Data Indicators:*** Alluvial soils
	Support of vegetation		Hyporheic flow helps support forested riparian areas. ***Land use impacts:*** Fill in the floodplain limits potential hyporheic interactions. ***Available Data Indicators:*** Alluvial soils, Riparian wetlands
	Maintenance of base flows		Groundwater/surface water interactions are important to maintain base flows and cooler stream temperatures during summer months. ***Land use impacts:*** Removal of LWD and other changes to hydrology that alter channel complexity (e.g., mining) may limit hyporheic functions. ***Available Data Indicators:*** Alluvial soils

	Processes	Shoreline Type	Functions, Impacts, and Indicators
Vegetation	**Temperature regulation**	Riverine/ Lacustrine	Riparian vegetation helps maintain cool water temperatures through shade and creation of a cool and humid microclimate over the stream. In large rivers and lakes, shading from vegetation has a more limited potential to provide temperature refuge compared to smaller streams. ***Land use impacts:*** Vegetation removal limits riparian functions. ***Available Data Indicators:*** Forested riparian vegetation, 303(d) listings for temperature
		Marine/ Estuarine	Marine/estuarine riparian vegetation shades the upper intertidal, which helps maintain temperatures adequate for embryonic development of intertidally spawning forage fish. Tidal marsh vegetation helps regulated temperatures locally. ***Land use impacts:*** Vegetation removal limits riparian functions. ***Available Data Indicators:*** Forested vegetation; wetlands
	Provision of LWD and other organic matter	Riverine/ Lacustrine	Riparian vegetation provides a source of LWD recruitment, and provides organic matter that is the base of the detrital food web in the form of leaves, branches, and terrestrial insects. ***Land use impacts:*** Vegetation removal limits riparian functions. Armored shorelines can isolate the river or lake from potential sources of LWD recruitment. ***Available Data Indicators:*** Forested vegetation *Other indicators (not available):* Armoring
		Marine/ Estuarine	Salt marsh productivity is among the highest reported for any ecosystem. Other estuarine and marine vegetation communities (e.g., eelgrass beds, dunes, kelp forests) also support detrital export. ***Land use impacts:*** Fill or isolation of tidal marshes limits functions. Vegetation removal limits riparian functions. ***Available Data Indicators:*** Wetlands, Marine vegetation (eelgrass, dune grass, salt marsh), Armoring, Dikes

	Processes	Shoreline Type	Functions, Impacts, and Indicators
Vegetation	**Filtering excess nutrients, fine sediment, and toxic substances**	Riverine/ Lacustrine	Dense riparian vegetation encourages infiltration of surface water. Nutrients and contaminants in subsurface water are filtered out of the soil and taken up by the roots of plants. The root structure of woody vegetation stabilizes shoreline soils and prevents excessive erosion. ***Land use impacts:*** Vegetation removal limits riparian functions. Development contributes to nutrient and contaminant loads. Impervious surfaces related to roadways, driveways and parking areas tend to produce hydrocarbon pollutants and heavy metals. Where stormwater is piped directly to the waterbody, vegetative functions are ineffective at addressing water quality. ***Available Data Indicators:*** Riparian vegetation, Forested riparian vegetation, Impervious surfaces, 303(d) listings, Wastewater outfalls *Other indicators (not available):* Septic mapping, stormwater outfalls
		Marine/ Estuarine	Tidal marshes, shellfish beds, and eelgrass beds support nutrient filtration. ***Land use impacts:*** Fill or isolation of tidal marshes, destruction of eelgrass or shellfish beds limits functions. Development contributes to nutrient and contaminant loads. Impervious surfaces related to roadways, driveways and parking areas tend to produce hydrocarbon pollutants and heavy metals. Where stormwater is piped directly to the waterbody, vegetative functions are ineffective at addressing water quality. ***Available Data Indicators:*** Vegetation coverage, Wetlands, Armoring, Dikes, Marine vegetation (eelgrass, salt marsh), Wastewater outfalls *Other indicators (not available):* Septic mapping, stormwater outfalls
	Energy attenuation		(See hydrologic)

	Processes	Shoreline Type	Functions, Impacts, and Indicators
Habitat	**Physical space and conditions for life history; Food production and delivery**	Riverine	Many aquatic species, including salmon species, rely heavily on off–channel areas for rearing. Riparian habitats are important for breeding, foraging, and rearing of many terrestrial species. Continuous riparian vegetation provides dispersal corridors. Larger and wider riparian and wetland areas tend to have more complex vegetation communities and more habitat types. ***Land use impacts:*** Vegetation removal and wetland fill limit functions. Roads and upland development limit lateral habitat connectivity. Dams and culverts can interrupt longitudinal habitat connectivity. ***Available Data Indicators:*** Priority Habitats and Species (PHS) occurrence, Levees, Roads, Vegetation, Wetlands, Dams, Fish passage barriers
		Lacustrine	Riparian habitats are important for breeding, foraging, and rearing of many terrestrial species. Continuous riparian vegetation provides a dispersal corridor for animals using riparian habitats. Larger and wider riparian and wetland areas tend to have more complex vegetation communities and more habitat types. ***Land use impacts:*** Vegetation removal and wetland fill limit functions. Roads and upland development limit lateral habitat connectivity. Overwater structures shade areas of submerged aquatic vegetation and create abrupt transitions in shading that can alter habitat use by local species assemblages. ***Available Data Indicators:*** PHS occurrence, Overwater structures, Roads, Vegetation, Wetlands
		Marine/ Estuarine	Riparian habitats, including forested, dune, and wetland vegetation communities are important for breeding, foraging, and rearing of many terrestrial species. Continuous riparian vegetation provides a dispersal corridor for animals using riparian habitats. Larger and wider riparian and wetland areas tend to have more complex vegetation communities and more habitat types. Eelgrass beds, mudflats, tidal marshes, and coastal dunes provide habitat functions for a diverse suite of species. ***Land use impacts:*** Overwater structures shade areas of submerged aquatic vegetation and create abrupt light transitions that can alter habitat use by local species assemblages. Shoreline armoring tends to truncate the intertidal area. Dikes disconnect open water habitats from tidal marshes. Roads and upland development limit lateral habitat connectivity. ***Available Data Indicators:*** PHS occurrence, Armoring, Dikes, Overwater structures, Roads, Vegetation, Wetlands, Fish passage barriers *Other indicators (comprehensive mapping not available):* Tide gates

The available information gathered in the Shoreline Inventory was used to help characterize the ecological functions for each reach.

Hyporheic functions are generally dependent on directional flow, and therefore, hyporheic functions are less applicable in lake, estuarine, and marine environments. For these reasons, hyporheic functions were not evaluated for lake, estuarine, or marine environments.

For each of the data indicators used in the characterization, the quantitative data were sorted into five categories, ranging from “low” to “high.” The sorting of quantitative data into scoring categories was primarily based on the distribution range of the parameter within the County. For example, vegetation and forest cover is relatively high in shorelines throughout most shorelines in the County. In order to differentiate between shoreline reaches with lower vegetation coverage relative to other reaches in the County, the range of quantitative results classified as “Low” scores was increased (0-40%) and the range of quantitative scores identified as “High” was narrowed to only shorelines with over 90 percent vegetation coverage. Table 5-4 provides a description of the metrics.

Table 5-4. Functional Score Ranking by Indicator Metric

Function	Indicator Metric	Unit of Measure	Ranking score*					Applicable Habitat			Notes
			Low	**Low/ Moderate**	**Moderate**	**Moderate/ High**	**High**	**Riverine**	**Lacustrine**	**Marine/ Estuarine**	
Hydrologic	Floodplain/ Floodway	% Area in floodplain	0-5	5-25	25-50	50-75	75-100, or floodway present	X	X	NA	Not mapped within freshwater shorelines in the QIR
	Forested vegetation in the floodplain	% of floodplain area	0-40	40-60	60-75	75-90	90-100	X	X	NA	
	Armoring/ dikes	Average % armored	60-100	30-60	10-30	0-10	0	NA	NA	X	
	Wetlands, roads, and impervious surfaces are indicators that relate to hydrologic functions and the impairment of those functions; but those indicators are also relevant to vegetation and habitat, and are addressed under habitat functions, below. Dams affect hydrologic function at a watershed, as well as a local scale. Rather than incorporate dams and tidegates into the quantitative scoring, they are addressed in the text in Section 5.2.										
Hyporheic	Geology-alluvium	% Area	0-20	20-40	40-60	60-80	80-100	X	NA	NA	
	Riparian wetlands are related to recharge processes and hyporheic functions, but they are addressed under habitat functions, below.										
Vegetation	Tree/Forest cover	% Area	0-40	40-60	60-75	75-90	90-100	X	X	X	Including woody wetlands, excluding scrub/shrub
	Vegetation - total	% Area	0-40	40-60	60-75	75-90	90-100	X	X	X	Not including developed classifications or cultivated crops

Function	Indicator Metric	Unit of Measure	Ranking score*					Applicable Habitat			Notes
			Low	Low/ Moderate	Moderate	Moderate/ High	High	Riverine	Lacustrine	Marine/ Estuarine	
	Marine vegetation-eelgrass/ salt marsh	Presence/ Absence	Absent		Patchy		Continuous	NA	NA	X	Score based on occurrence of either community within 500 feet of reach
	Armoring and dikes are factors that affect vegetative functions, but those indicators are also relevant to hydrologic functions, and where data are available, they are addressed there. Similarly, wetlands provide vegetative functions, as well as hydrologic functions, but they are addressed under habitat.										
Habitat	Priority habitats and species	Number of regions/ species	0	1	2-4	5-7	8+	X	X	X	Including species identified within 500 feet of reach
	Wetlands	% Area	0-20	20-40	40-60	60-80	80-100	X	X	X	
	Roads	Miles of road /Reach area (acres)	0-0.001	0.001-0.005	0.005-0.01	0.01-0.02	>0.02	X	X	X	Both major and minor roads are considered
	Fish passage barriers	#/reach	>1		0-1		0	X	X	X	Including those identified as partial or complete barriers
	Armoring and vegetation are also indicators of habitat functions, but they are also relevant to hydrologic and vegetation functions, so they are addressed in the appropriate section above.										

* If a number occurs at a break point between categories, it is assigned to the higher functioning category.

5.1.3 Limitations

The functional results are intended to complement the inventory information in Chapters 3 and 4. Functional scores should not be viewed as an absolute measure of existing ecological function, but rather as a snapshot of shoreline characteristics. This evaluation was limited by the quality and availability of inventory data. Therefore, limitations presented in Section 4.3 also apply to this evaluation. Specific functional attributes that were not available at a Countywide scale include direct measures such as density of LWD, channel incision, sediment composition, armored banks, vegetation species composition, etc.

In particular, analysis of hyporheic functions using broad scale spatial data is particularly challenging. The occurrence of alluvial soils can indicate a propensity for inter-gravel hydrologic exchange, and this is the only scoring metric used that is unique to hyporheic functions. Other indicators of hyporheic functions may include the presence of wetlands, broad meanders and point bars in large rivers. Unfortunately, alluvial soils are not a good indicator of hyporheic functions in smaller tributaries, where hyporheic activity is driven by local scale geomorphic conditions (e.g., frequency of pools) (Kasahara and Wondzell 2003)

Hydrologic, hyporheic, vegetation, and habitat functions are inter-related, and frequently controlled by similar landscape attributes. Rather than repeatedly assessing the same indicator to assess functions for each category, each indicator is included only once in the evaluation with the functional category to which it is most closely correlated, as noted in Table 5-4. For example, wetlands play an important role in each functional category, but wetlands are only incorporated into the scoring of habitat functions.

The evaluation approach did not take into account that some areas naturally may function "lower" than others, not because of any anthropogenic alteration or natural disturbance, but simply because of the combined effects of a particular locale's geology, aspect, or topography. For example, many functions operate "better" in this evaluation approach when there is a floodplain to capture sediments or store water, but there are a number of drainages in steep areas that do not have floodplains. Similarly, riparian wetlands tend to be larger along low gradient rivers with broad floodplains. Tributaries in steeper drainages are likely to have low wetland scores compared to river valley locations. It is also important to note that the wetland scores provided in this analysis only represent the relative density of wetlands along the shoreline reaches, and the scores are not meant to represent the quality of wetland in any given area. Because of the inherent differences in functions and processes among different AUs, the functional assessment scores should be used to provide an understanding of the relative characteristics of different shoreline reaches within AUs and low scores should not be interpreted as a direct measure of functional impairment without additional evaluation to determine the cause of the score.

In evaluating shoreline functions, the assessment of shoreline conditions and impacts to functions was generally limited to the area of shoreline jurisdiction. In many cases, shoreline impacts may occur at a site due to ecological and geomorphological processes that are disturbed at a remote site upstream, further inland, or up-current. This evaluation approach may not identify all of the functional responses occurring as a result of impacts to nearby or remote areas.

The approach was limited to an evaluation of shoreline ecological potential, and it did not integrate this potential with the opportunity to perform a given function based on site-specific conditions. For example, the analysis assessed the ability of a shoreline to store water, but it did not consider the frequency of flooding downstream and the corresponding significance of such a function.

5.2 Results

5.2.1 Queets

Only a small portion of the Queets River basin is located within Grays Harbor County. With the exception of the upper portion of the Salmon River, all shoreline reaches in this AU are located within the QIR. The lower Queets River exhibits broad meanders, and oxbow wetlands provide indications of past channel migration (Photo 1). Hyporheic exchange is expected to be high as a result of channel sinuosity, point bar formations, and relic channels that continue to support hyporheic flow. Alluvial soils are limited in Harlow Creek, and hyporheic functions are expected to be determined by local scale geomorphic features. Development is limited on the Queets River, and vegetation is affected by past forestry practices. Similarly, the Salmon River Basin is primarily in forestry uses, and floodplain processes and connectivity are largely intact (Photo 2). The lower Queets River and the Salmon River support several species of salmonids, and areas adjacent to the Salmon River support nesting marbled murrelets, and spotted owls.

Figure 5-1 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Queets River AU are provided in Table 5-5.

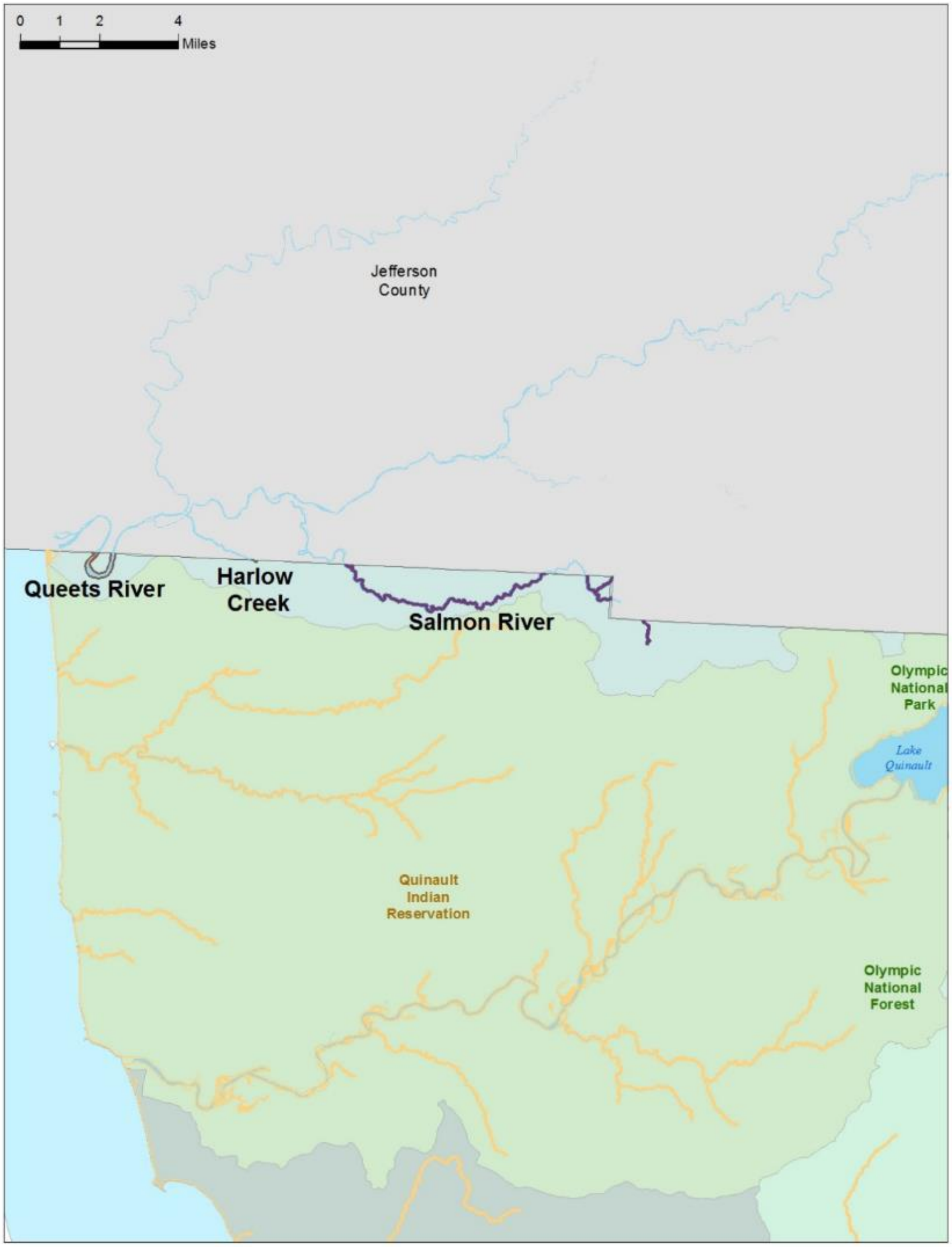


Figure 5-1. Reaches in the Queets AU.

Table 5-5. Reach Functional Analysis Scores in the Queets AU.

L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions. Blank cells indicate no data available. QIR- Quinault Indian Reservation, ONF- Olympic National Forest.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers
Harlow Creek – 1 (QIR)			L	H	H	L	L/M	M/H	H
Queets River – 1 (QIR)			H	M	M	M/H	L/M	M/H	H
Salmon River – 1 (QIR/ONF)			H	M/H	H	H	L/M	M/H	H

Photo 1. Queets River within Grays Harbor County

Photo 2. Salmon River and floodplain in the QIR

Potential Restoration Opportunities

Key opportunities for restoration and protection that were identified in the WRIA 21 Queets/Quinault Salmon Habitat Recovery Strategy for the Queets River AU are listed in Table 5-6.

Table 5-6. Restoration Opportunities in the Queets River AU

Actions	Source
• Remove stream crossing structures on closed and abandoned roads. • Replace or upgrade culvert and bridges on a priority basis to fully accommodate large storm events and to ensure unimpeded fish passage. (A design project was proposed for several culvert replacements on the Salmon River was funded in 2012)	WRIA 21 Lead Entity 2011

5.2.2 Quinault

The Quinault River AU is primarily undeveloped. The lower basin is located in the QIR, and above Lake Quinault, the basin is in federal ownership. The upper and lower reaches of the Quinault River have distinct geomorphic structure as a result of differences in sediment transport resulting from the influence of Lake Quinault. Lake Quinault traps most sediment and wood that are transported from the Olympic Mountain headwaters (O'Connor et al. 2003). Above the lake, the Upper Quinault River exhibits a wide floodplain and a wide active channel with braided channel morphology, riparian wetlands, and high channel mobility (Photo 3) (QIN 1999). Hyporheic exchange is expected to be high in these braided reaches. The removal of mature forest from the floodplain of the upper Quinault River has contributed to increased instability of the channel (WRIA 21 Lead Entity 2011).

The shorelines of Lake Quinault alternate between areas of residential development and undeveloped lands. Developed areas (Lake Quinault – 1, 4, and 6-8) include shoreline stabilization structures and a few overwater structures, and forested riparian vegetation is reduced in these reaches (Photo 4) (Table 5-7). Derelict piles are also present in areas around the lake. Large accumulations of LWD have formed along undeveloped lakeshore areas on the northeast (Upper Quinault River – 3) and southwest (Lake Quinault – 3) shorelines of the lake. Extensive floodplain wetlands are present on the northeast side of the lake. Although comprehensive mapping of landslide hazards throughout the County was not identified, landslide hazard mapping in the Quinault basin identified a landslide hazard along Slide Creek that extends into shoreline jurisdiction in Lake Quinault – 4 (Wegmann 2004). Wegmann (2004) also mapped landslide hazards on the left bank (looking downstream) of Quinault – 2, and along Prairie Creek – 1 and Cook Creek – 2.

The shallow waters in the Upper Quinault River provide breeding areas for harlequin ducks, and the Upper Quinault valley provides crucial wintering habitat for Roosevelt elk. Threatened marbled murrelets and spotted owls have also been identified in forested areas near or adjacent to the Upper Quinault and Lake Quinault shorelines.

Riparian functions are reduced just downstream from Lake Quinault (Quinault River – 5) as a result of development, which includes the unincorporated community of Amanda Park (Photo 4). Further downstream, the Quinault River flows through a wide coastal piedmont. Sediment transport is driven by erosion of the bed and banks and Pleistocene bluffs adjacent to the river (QIN 1999). Hyporheic functions are expected to be high through the mainstem Quinault as a result of alternating gravel bars and relic channels. The scores for wetlands in Table 5-7 under-represent actual wetland functions along the Lower Quinault River Extensive riparian wetlands are apparent along the Lower Quinault River based on aerial photographs (Photo 5), but because floodplain areas are not mapped within the QIR, these wetlands are not mapped as occurring in shoreline jurisdiction, resulting in lower scores for wetlands.

The steeper tributaries in this AU do not have extensive alluvial soils, resulting in low ratings for hyporheic functions (Table 5-9). However, as discussed in Section 5.1.2, actual hyporheic functions in the watercourses in this AU are likely determined by local scale geomorphic conditions (Kasahara and Wondzell 2003).

Instream wood is the major factor driving channel migration, and channel migration is a major factor influencing the natural variability of riparian vegetation and seral stages (QIN 1999). As a result of logging operations since the 1920's, the riparian area forest species, diversity, abundance, and size has been reduced (QIN 1999). The history of logging and the extensive removal of large conifers from the floodplain are likely correlated with lower densities of LWD and reduced channel migration rates in the last few decades (QIN 1999). Despite these changes, forested vegetation coverage is still high throughout the Quinault Watershed, with the exception of Quinault River – 1, in the Town of Taholah. The shoreline in Quinault River – 1 includes riprap armoring and development along the river's shoreline; forested vegetation is only present in the eastern portion of the reach.

PHS species presence tends to be highest in mainstem and lower gradient tributary reaches (Table 5-7) because these areas support the greatest number of anadromous salmon species. The Quinault National Fish Hatchery is located along Cook Creek – 2 within the QIR. An electric weir blocks most active fish passage above the hatchery (Zajac 2004). Additionally, the QIN operates a hatchery and pen-rearing facility on Lake Quinault.

The Raft River and independent tributaries, including Whale, Camp, and Duck Creek were heavily impacted by logging practices in the early 20th Century (Smith and Caldwell 2001). Fish passage barriers as a result of these past practices remain a significant issue in these watersheds (WRIA 21 Lead Entity 2011).

Figure 5-2 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Quinault River AU are provided in Table 5-7.

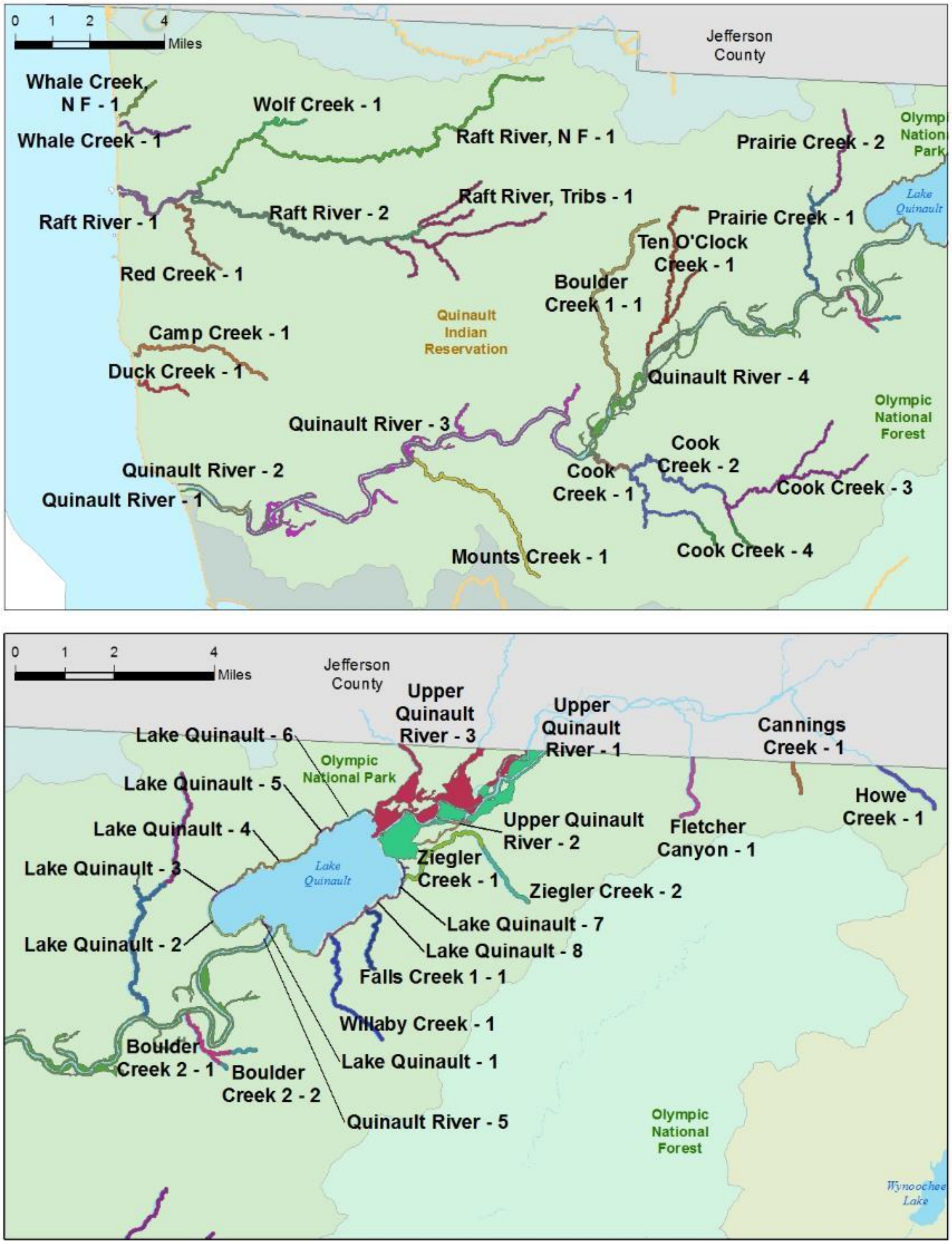


Figure 5-2. Reaches in the Quinault AU.

Western portion of AU in top panel, and eastern portion of AU in lower panel.

Table 5-7. Reach Functional Analysis Scores for the Quinault AU.
L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions. Blank cells indicate no data available. QIR- Quinault Indian Reservation, ONP- Olympic National Park, ONF- Olympic National Forest, CBW- Colonel Bob Wilderness.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers
Boulder Creek 1 – 1 (QIR)			L	H	H	M	L	M/H	H
Boulder Creek 2 – 1 (QIR)			M/H	H	H	M/H	L	M/H	H
Boulder Creek 2 – 2 (QIR)			L	H	H	M/H	L	M	H
Camp Creek – 1 (QIR)			L/M	H	H	L	L	M	L/M
Cannings Creek – 1 (ONP)			L	H	H	L	L	M/H	H
Cook Creek – 1 (QIR)			L	H	H	M/H	L	M/H	H
Cook Creek – 2 (QIR)			L	H	H	M/H	L	M/H	L
Cook Creek – 3 (ONF)			L	H	H	M	L	M/H	H
Cook Creek - 4	L	NA	L	M/H	H	L	L	M/H	H
Duck Creek – 1 (QIR)			L/M	H	H	L	L	M/H	H
Falls Creek 1 – 1 (ONF)			L	H	H	M/H	L	L/M	H
Fletcher Canyon – 1 (CBW)			L	H	H	L	L	M	H
Howe Creek – 1 (ONP)			L	H	H	L	L	M/H	H
Lake Quinault – 1 (QIR)			L	L	M	L	L/M	L/M	H
Lake Quinault – 2 (QIR)			L	M	M/H	L	L/M	M/H	H
Lake Quinault – 3 (ONP)			L	H	H	L	L	H	H
Lake Quinault – 4 (ONP)			L	L/M	M	M	L	M/H	H
Lake Quinault – 5 (ONP)			L	M/H	M/H	M	L	L/M	H
Lake Quinault – 6 (ONP)			L	L	H	L	L	M/H	H
Lake Quinault – 7 (ONF)			H	M	H	H	M	M	H
Lake Quinault – 8 (ONF)			L	M/H	M/H	M/H	L/M	L/M	H
Mounts Creek – 1 (QIR)			L	L/M	H	M	L	M/H	H
Prairie Creek – 1 (QIR)			L	M/H	H	M/H	L/M	M/H	H
Prairie Creek – 2 (QIR/ONF)			L	H	H	M	L	M/H	H
Quinault River – 1 (QIR)			H	L	L	H	L	L	H
Quinault River – 2 (QIR)			M	H	H	H	L/M	M/H	H
Quinault River – 3 (QIR)			M/H	M/H	H	H	M	M/H	L/M
Quinault River – 4 (QIR)			H	M/H	M/H	H	M	M/H	L/M
Quinault River – 5 (QIR)			L	L	M	H	L	L	H
Raft River – 1 (QIR)			M/H	M	M/H	M	L/M	M/H	H
Raft River – 2 (QIR)			M/H	H	H	M	L/M	M/H	H

Reach	Hydrologic		Hyporheic- Alluvium	Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain		Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers
Raft River, NF – 1 (QIR)			L	H	H	M	L	M/H	L
Raft River, Tribs – 1 (QIR)			L	H	H	L	L	M/H	H
Red Creek – 1 (QIR)			L	M/H	M/H	M	L	M	L/M
Ten O'clock Creek – 1 (QIR)			L	H	H	M/H	L	M/H	H
Upper Quinault River – 1 (ONF)			H	M	M	H	H	M/H	H
Upper Quinault River – 2 (ONF)			H	M	M/H	H	M/H	L/M	H
Upper Quinault River – 3 (ONP)			H	M	M/H	H	H	M/H	H
Whale Creek – 1 (QIR)			L	M/H	H	L	L	M	H
Whale Creek, NF – 1 (QIR)			L	M/H	H	L	L	H	H
Willaby Creek – 1 (ONF)			L	H	H	M/H	L	M/H	H
Wolf Creek – 1 (QIR)			L	H	H	M	L	M/H	H
Ziegler Creek – 1 (ONF)			H	M	M/H	H	L	L/M	H
Ziegler Creek – 2 (CBW)			L	H	H	L	L	M/H	H

[1] Hyporheic functions are not evaluated for lake shorelines.

Photo 3. Upper braided reach of Quinault River (Upper Quinault River 1-3)

Photo 4. South end of Lake Quinault and the unincorporated area of Amanda Park (Lake Quinault-1, Quinault River-5)

Photo 5. Lower Quinault River and broad floodplain wetlands (Quinault River-2)

Potential Restoration Opportunities

Key opportunities for restoration and protection that were identified in the WRIA 21 Queets/Quinault Salmon Habitat Recovery Strategy for the Quinault River AU are listed in Table 5-8.

Table 5-8. Restoration Opportunities in the Quinault River AU

Waterbody/Actions	Source
Lower Quinault River	
• Restore natural connectivity to off-channel habitats in which passage has become impeded. • Enhance off-channel habitats by deepening and/or adding structure where opportunities exist. • Create new off-channel habitats by dredging and/or installation of channel flow controls to create ponds. • Control the invasive reed canary grass and knotweeds.	WRIA 21 Lead Entity 2011
Upper Quinault River	
• Construct ELJs to begin restoration of stable islands and to stabilize side channels, protect floodplain terraces, and restore more normative sediment sorting and storage processes. • Restore riparian forest quality with conifer underplantings. • Implement actions to make needed improvements in infrastructure in the upper Quinault valley with road setbacks, bridge improvements, and culvert replacements.	WRIA 21 Lead Entity 2011
Lake Quinault	
• Reduce the number of overhead structures along the shoreline of Lake Quinault	WRIA 21 Lead Entity 2011
All	
• Remove stream crossing structures on closed and abandoned roads. • Replace or upgrade culvert and bridges on a priority basis to fully accommodate large storm events and to ensure unimpeded fish passage. (underway)	WRIA 21 Lead Entity 2011
• Expand buffer widths on tribal and public lands where opportunities exist. • Expand buffer widths on private lands through incentives and conservation easements. • Restore riparian forest quality with conifer underplantings. • Employ thinning practices within riparian forests to create desired species and age composition. • Identify key land parcels for purchase and protection; implement purchases as opportunities exist. • Reduce and control patches of invasive knotweeds as they become established in riparian corridors. • Formulate basin-wide riparian restoration plans. • Community outreach forums and education on knotweed control and riparian restoration.	WRIA 21 Lead Entity 2011

Waterbody/Actions	Source
• Formulate Road Maintenance and Abandonment Plans (RMAP) on all forest lands and subsequent implementation for upgrading, maintaining, or decommissioning.	WRIA 21 Lead Entity 2011
• Decommission roads and restore roadbeds to pre- management conditions where possible. • Drain roads to the forest floor for runoff infiltration and maintenance of water table where possible. • Manage for greater diversity in stand age to the extent possible.	WRIA 21 Lead Entity 2011
• Use fertilizer supplements in Lake Quinault and streams that are likely to be nutrient limited	WRIA 21 Lead Entity 2011

5.2.3 Moclips/Copalis

Similar to the small tributaries to the north, the Moclips/Copalis AU was heavily impacted by logging practices in the early 20th Century (Smith and Caldwell 2001). Today, land use is predominantly forestry (Photo 6), with more intensive recreation and residential areas limited to the reaches near the Pacific Coast (Moclips River – 1, Connor Creek – 1, and Copalis Creek – 1) (Photos 7 and 8). Forest coverage is high along the shorelines through the forest lands, and reduced in the lower reaches as a result of both development and the natural occurrence of emergent marsh and dune vegetation communities near the Pacific Coast. Extensive wetland areas are found in Copalis River – 1, Connor Creek – 2, and Cranberry Creek – 1. These wetlands are expected to provide habitat functions for waterfowl, amphibians, and other fish and wildlife. Differences in PHS scoring in Table 5-9 are related to documented anadromous fish use within the shoreline reaches.

The smaller rivers and creeks in this AU do not have extensive alluvial soils, resulting in low ratings for hyporheic functions (Table 5-9). However, as discussed in Section 5.1.2, actual hyporheic functions in the watercourses in this AU are likely determined by local scale geomorphic conditions (Kasahara and Wondzell 2003).

Figure 5-3 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Moclips/Copalis AU are provided in Table 5-9.

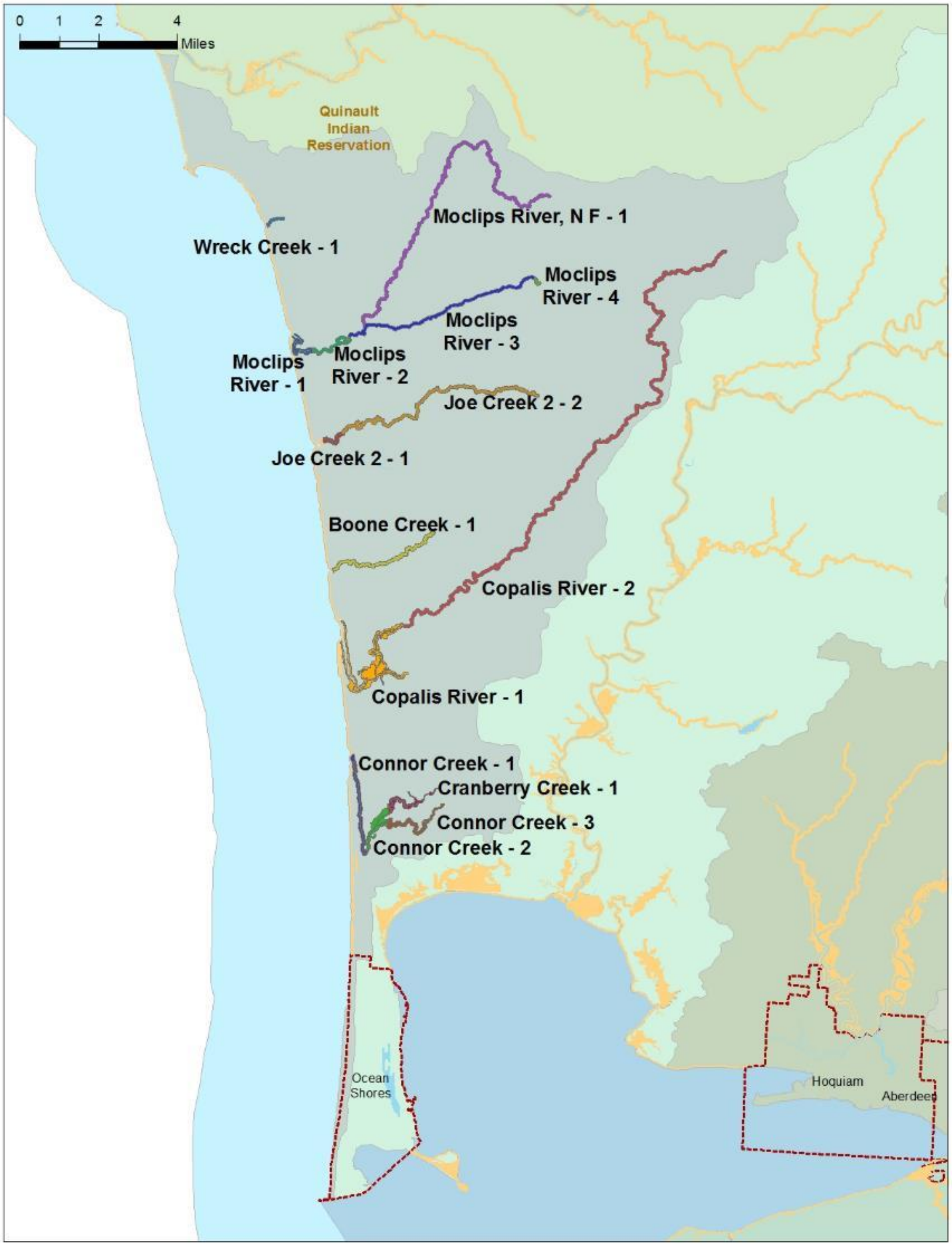


Figure 5-3. Reaches in the Moclips/Copalis AU.

Table 5-9. Reach Functional Analysis Scores in the Moclips/Copalis AU.
L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions. Blank cells indicate no data available. QIR- Quinault Indian Reservation.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers
Boone Creek – 1	M/H	H	L	H	H	L	L	M/H	H
Connor Creek – 1	M	L/M	L	L/M	M	M	L	M	H
Connor Creek – 2	H	M/H	L	M/H	H	L	H	M/H	H
Connor Creek – 3	M/H	H	L	H	H	L	L/M	M/H	H
Copalis River – 1	H	L/M	L	L/M	H	M/H	M/H	H	L/M
Copalis River – 2	M	H	L	H	H	M	L	M/H	H
Cranberry Creek – 1	M/H	H	L	H	H	L	M/H	M/H	H
Joe Creek 2 – 1	M/H	H	L	M/H	M/H	L/M	L/M	H	H
Joe Creek 2 – 2	M/H	H	L	M/H	H	L/M	L	M/H	H
Moclips River – 1	M/H	M	L	L/M	L/M	M	L	L/M	H
Moclips River – 2	H	H	L	H	H	M/H	L	M/H	H
Moclips River – 3 (QIR)			L	H	H	M	L	M/H	H
Moclips River – 4	L	NA	L	H	H	L	L	M/H	H
Moclips River, NF – 1 (QIR)			L	H	H	M	L	H	L/M
Wreck Creek – 1 (QIR)			L	H	H	L	L	M/H	H

Photo 6. Typical riparian condition with surrounding forested lands on the Moclips River (Moclips River-3)

Photo 7. Lower Copalis River, showing adjacent tidal emergent wetlands and development (Copalis River-1)

Photo 8. Large wetland and development near the mouth of Connor Creek (Connor Creek-1 & 2)

Potential Restoration Opportunities

Key opportunities for restoration and protection that were identified in the WRIA 21 Queets/Quinault Salmon Habitat Recovery Strategy for the Moclips/Copalis AU are listed in Table 5-10.

Table 5-10. Restoration Opportunities in the Moclips/Copalis AU

Actions	Source
• Add large wood debris and wood jams to streams that have diminished wood loads. • Restore old-growth characteristics of the riparian corridors.	WRIA 21 Lead Entity 2011

5.2.4 Humptulips

The upper two-thirds of the East and West Fork drainages are in the Olympic National Forest (Photo 9). The majority of the remainder of the drainage is in private forest ownership. Forested vegetation is high throughout the tributaries in the AU (Table 5-11). The history of logging and high density of roads throughout the watershed have impaired watershed functions, specifically water temperatures, sediment loads, and fish passage (Grays Harbor Lead Entity 2011). Humptulips River, WF –2 within Olympic National Forest, and Stevens Creek – 1 are included in a TMDL for water temperature. Shoreline reaches in the upper watershed (Humptulips, WF – 1 and 2, Humptulips, EF – 1 and 2, Donkey Creek – 1, and Chester Creek – 1) support a range of rare and vulnerable wildlife species, including Roosevelt elk, marbled murrelets, and spotted owls. Several landslide hazard areas are mapped along Phillips Creek in Chester Creek-1 (Wegmann 2004).

Floodplain wetlands are most extensive in the lower reaches of the Humptulips (Humptulips River – 1, 3, 4, and 6) (Photo 10) and lower elevation tributaries (e.g. Chenois and Damon Creeks). Forested vegetation within the floodplain is reduced along the mainstem Humptulips (Humptulips River – 1, 2, 6-9) compared to other reaches in the AU as a result of development within the floodplain.

Alluvial soils are concentrated in the mainstem Humptulips River, particularly downstream from the unincorporated community of Humptulips (Humptulips River – 5-8), where the transition to a more gradual gradient results in alternating sand bars and shifting banks (Smith and Wenger 2001). These alluvial soils, sand bars, and channel meanders are expected to provide high hyporheic activity. Historically, the Humptulips was used for substantial gravel bar mining (Collins and Dunne 1989). Since 1990, the total permitted gravel bar harvest may not exceed 6,500 cubic yards. An active gravel pit mine is also still present near the Town of Humptulips (Humptulips River – 9). Limited diking and shoreline armoring in Humptulips – 2 (6-6.7 RM) limits channel migration there (Grays Harbor Lead Entity 2011).

Several overwater structures and derelict piles are present near the mouth of Chenois Creek.

A dam regulates water levels in Failor Lake (Photo 11). Failor Lake was created in Deep Creek to provide recreation opportunities, and is stocked annually to support a popular sports fishery (Smith and Wenger 2001). The dam is located above the natural limits of anadromy due to a natural falls at river mile 6.5. Nevertheless, the dam presents a complete barrier to resident fish passage on Deep Creek (WDFW 2013).

Figure 5-4 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Humptulips AU are provided in Table 5-11.

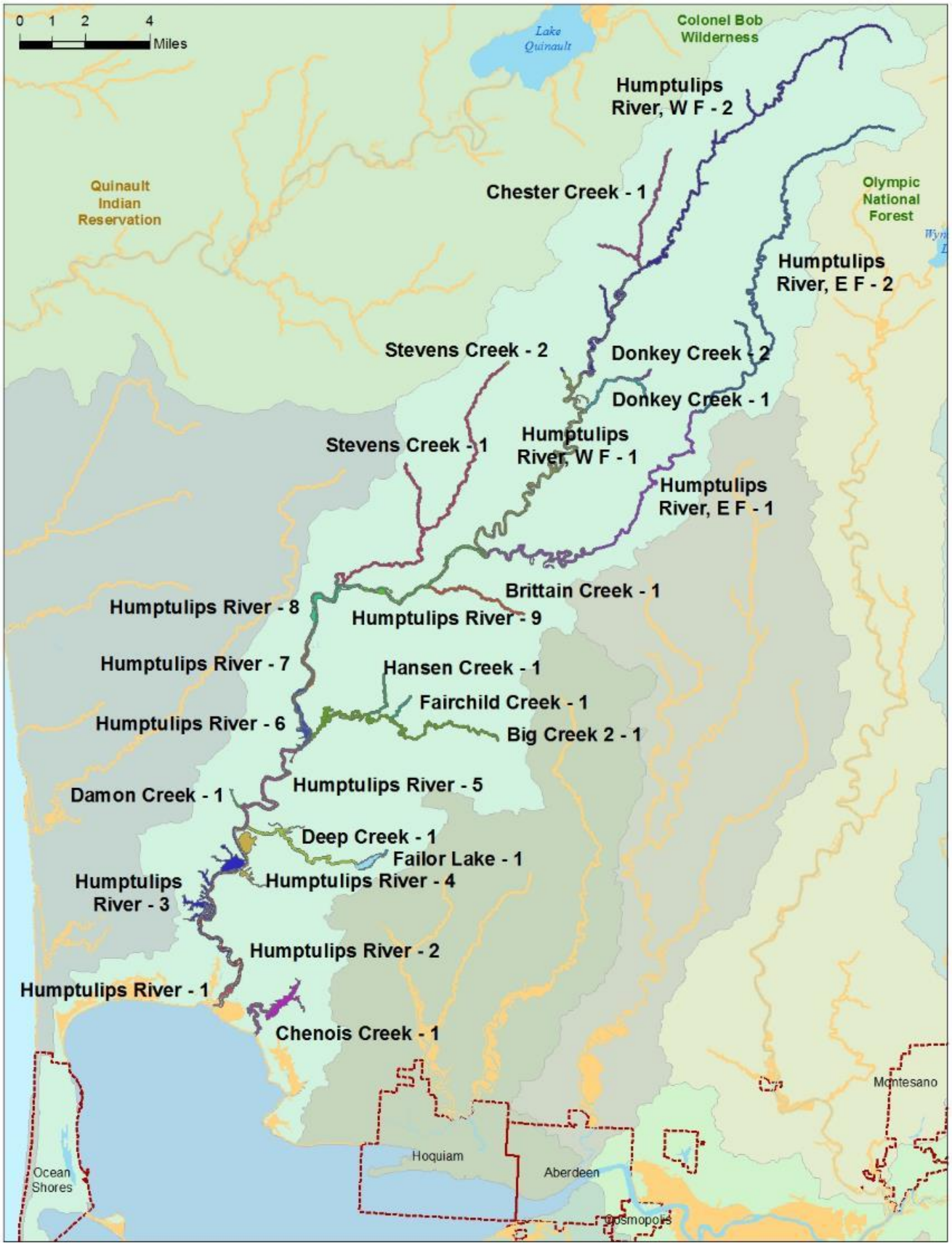


Figure 5-4. Reaches in the Humptulips AU.

Table 5-11. Reach Functional Analysis Scores for Humptulips AU.

L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions. Blank cells indicate data not available.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers
Big Creek 2 - 1	M/H	M/H	L	M/H	H	M/H	L	M/H	H
Brittain Creek - 1	L	H	L	M/H	H	M/H	L	M/H	H
Chenois Creek - 1	H	H	L	H	H	L/M	M/H	M/H	L/M
Chester Creek – 1 (ONF)			L	H	H	M	L	M	L/M
Damon Creek - 1	H	M/H	L	H	H	M/H	M/H	M/H	H
Deep Creek - 1	M	M/H	L	M/H	H	M	L	M/H	L/M
Donkey Creek - 1	M/H	M/H	L	M/H	H	M/H	L	M	H
Donkey Creek – 2 (ONF)			L	M/H	M/H	M	L	L/M	H
Failor Lake - 1	L	NA	NA[1]	M/H	M/H	L/M	L/M	L/M	L/M
Fairchild Creek - 1	L	H	L	H	H	M	L	M/H	H
Hansen Creek - 1	L		L	M/H	H	M/H	L	M	H
Humptulips River - 1	L/M	M	H	H	H	M/H	M/H	M/H	H
Humptulips River - 2	H	M	H	M	M/H	M/H	L/M	L/M	H
Humptulips River - 3	H	M/H	L/M	M/H	H	M/H	M/H	H	H
Humptulips River - 4	H	H	L/M	H	H	M/H	H	M/H	H
Humptulips River - 5	H	M/H	H	M/H	H	M/H	L/M	M/H	L/M
Humptulips River - 6	H	M	M/H	M	M/H	M/H	M/H	M/H	H
Humptulips River - 7	H	L/M	H	L/M	M	M/H	M	M/H	H
Humptulips River - 8	H	M	H	M/H	M/H	M/H	M	M/H	L/M
Humptulips River - 9	H	M	L/M	M	H	M/H	M	M/H	H
Humptulips River, EF - 1	H	M/H	L	M/H	H	H	L/M	M/H	H
Humptulips River, EF – 2 (ONF)			L	H	H	H	L	M/H	L/M
Humptulips River, WF - 1	H	M/H	L	M/H	H	H	M	H	H
Humptulips River, WF – 2 (ONF)			L	H	H	H	L/M	H	L/M
Stevens Creek - 1	H	M/H	L/M	M/H	H	M/H	L	M/H	L
Stevens Creek - 2	H	H	L	H	H	M	L	M/H	H

[1] Hyporheic functions are not evaluated for lake shorelines.

Photo 9. Forested areas at the confluence of the WF Humptulips River and Chester Creek (Humptulips WF-2 and Chester Creek-1)

Photo 10. Floodplain wetlands along the lower Humptulips River (Humptulips River-4)

Photo 11. Outlet of Failor Lake and Deep Creek (Failor Lake-1 and Deep Creek-1)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified, primarily in the Chehalis Basin Salmon Habitat Restoration and Protection Strategy, for the Humptulips River AU are listed in Table 5-12. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody. The 2001 Salmon and Steelhead Limiting Factors Report for WRIA 22 and 23 (Smith and Wenger) also prioritized actions as "high," "medium," or "low" for specific functions (e.g., estuary, floodplain, water quality, fish passage, sediment) by subbasin. Those restoration recommendations from Smith and Wenger (2001) that do not overlap with recommendations from the more recent Chehalis Basin Salmon Habitat Restoration and Preservation Strategy (Grays Harbor County Lead Entity 2011) are included in the tables below.

Table 5-12. Restoration Opportunities in the Humptulips Basin AU

Actions	Source	Priority
Actions to address water quality		
• Identify degraded riparian areas to focus riparian restoration efforts • Implement TMDL recommendations • Install livestock fencing/reduce livestock access • Interplant conifers in deciduous dominated areas • Revegetate riparian areas	Grays Harbor Lead Entity 2011	Tier 1
Actions to address sediment		
• Abandon roads on geologically sensitive slopes • Implement bioengineering for bank stabilization • Reduce road density • Minimize motor vehicle access to streams • Correct cross drains • Upgrade logging roads to comply with 1999 Forest and Fish Agreement	Grays Harbor Lead Entity 2011	Tier 1
• Relocate gravel extraction away from shorelines and 100-year floodplain • Protect and revegetate unstable slopes	Smith and Wenger 2001	High
Actions to address fish passage		
• Correct barrier culverts (bridges preferred) • Improve and add fishways	Grays Harbor Lead Entity 2011	Tier 1
Actions to address riparian habitat		
• Fee simple/easement protection of riparian vegetation on key properties	Grays Harbor Lead Entity 2011	Tier 2

Actions	Source	Priority
• Develop LWD supplementation plan that will install logjams • Install LWD pieces in conjunction with other restoration		
Actions to address floodplain, wetland, and side channel condition		
• Control invasive species • Reconnect and enhance floodplain and wetland habitat	Grays Harbor Lead Entity 2011	Tier 2
Actions to address biological processes		
• Increase use of carcasses to increase nutrients	Smith and Wenger 2001	Low

5.2.5 Hoquiam

As a result of past forestry practices and scattered rural residential development in the East Fork and West Fork Hoquiam River, riparian and floodplain conditions are reduced compared to their historical condition (Grays Harbor Lead Entity 2011). Vegetation coverage is most limited in the reaches closest to the City of Hoquiam (Hoquiam, WF – 1 and 3). Broad surge plain wetlands in in Hoquiam, EF – 2 and 3 (Photo 12) and Hoquiam, WF – 2 and 4 provide substantial hydrologic, hyporheic, vegetative, and habitat functions. Forterra and the Chehalis River Basin Land Trust recently purchased much of the surge plain, and approximately two thirds of the surge plain is now in conservation ownership.

Highway 101 parallels the West Fork Hoquiam, limiting potential channel migration (Photo 13). Partial and complete fish passage barriers are associated with Highway 101 and tributaries to the West Fork Hoquiam. PHS scores in Table 5-13 are largely driven by salmonid use in the Hoquiam AU. Chum, coho, and Chinook salmon, steelhead, and cutthroat trout have been documented in most of the shoreline reaches within the AU.

The 21 historic splash dams in the watershed have likely had lasting effects on LWD and floodplain connectivity (Grays Harbor Lead Entity 2011). The Hoquiam River experiences high water temperatures and fecal coliform levels (Grays Harbor County LE 2011); however, no watercourses are identified on the 305(b) or 303(d) list (Washington State Department of Ecology 2012).

The City of Hoquiam owns 7,500 acres of forested land within the West Fork Hoquiam River drainage that is protected as a municipal watershed and closed to public access (Photo 14). Within the municipal watershed, diversion dams on Davis Creek and the West Fork Hoquiam River (Hoquiam WF – 5) provide water storage for the City of Hoquiam. These dams limit downstream sediment transport, and the West Fork dam presents a partial fish passage barrier (WDFW 2013).

Figure 5-5 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Hoquiam River AU are provided in Table 5-13.

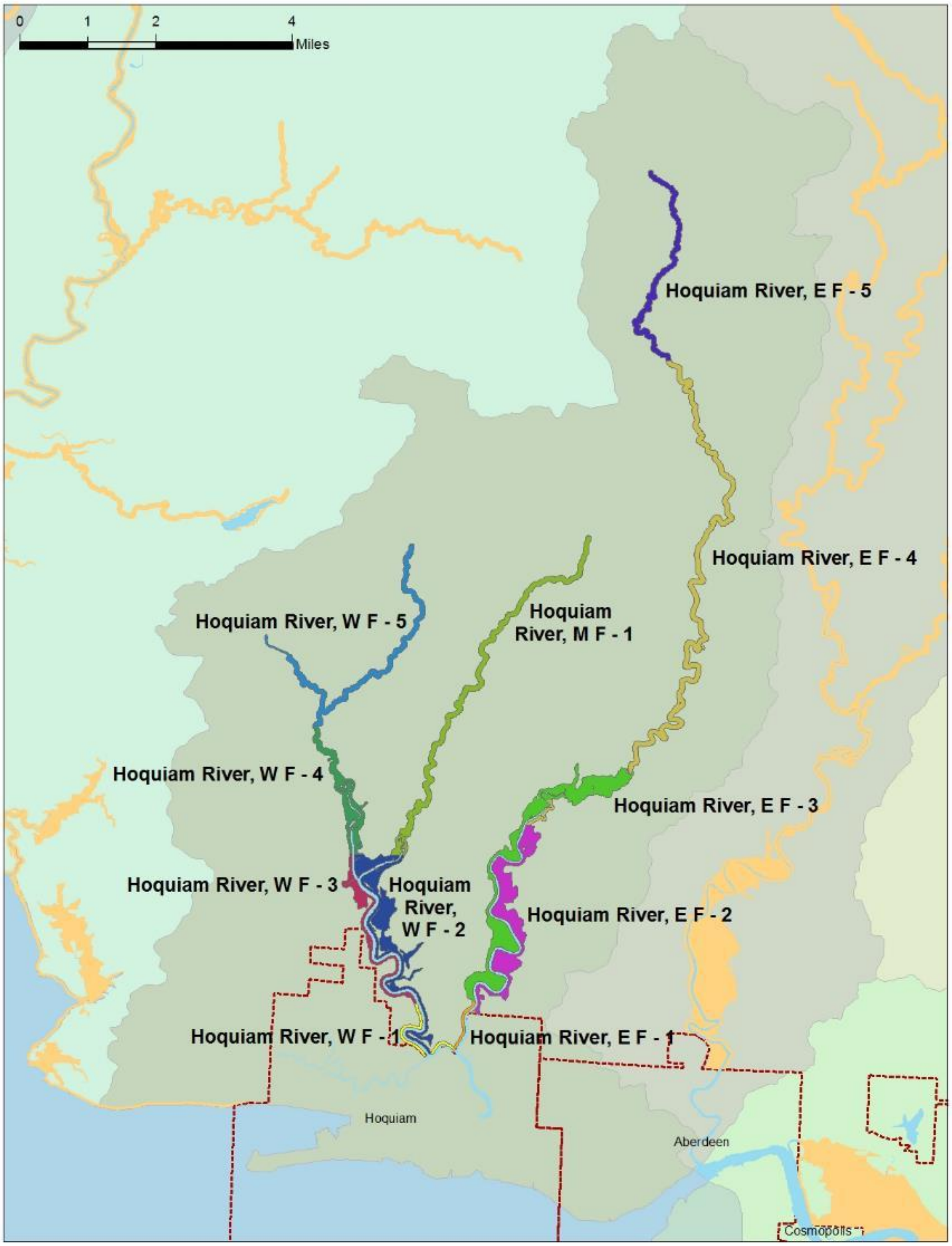


Figure 5-5. Reaches in the Hoquiam AU.

Table 5-13. Reach Functional Analysis Scores in the Hoquiam AU.

L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers
Hoquiam River, EF - 1	H	L	H	L/M	H	M/H	L/M	M	H
Hoquiam River, EF - 2	H	H	H	H	H	M/H	H	M/H	H
Hoquiam River, EF - 3	H	H	H	H	H	M/H	H	M/H	L/M
Hoquiam River, EF - 4	H	M/H	L	M/H	H	M/H	L	M	H
Hoquiam River, EF - 5	H	H	L	M/H	H	M	L	M/H	L/M
Hoquiam River, MF - 1	M/H	H	M	H	H	M/H	L	M	L/M
Hoquiam River, WF - 1	H	L	M/H	L	L	M/H	L/M	L/M	L/M
Hoquiam River, WF - 2	H	H	H	H	H	M/H	M/H	H	L/M
Hoquiam River, WF - 3	H	L/M	H	L/M	M	M/H	M	L/M	L/M
Hoquiam River, WF - 4	H	M/H	H	M/H	M/H	M/H	M/H	M	L
Hoquiam River, WF - 5	M/H	M	H	M/H	M/H	M/H	L	M	L

Photo 12. Broad floodplain wetlands on East Fork Hoquiam River (Hoquiam EF-2)

Photo 13. Highway 101 bounds the West Fork Hoquiam River (Hoquiam River WF-3)

Photo 14. City of Hoquiam-owned land along the WF Hoquiam River (Hoquiam WF- 5)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified, primarily in the Chehalis Basin Salmon Habitat Restoration and Protection Strategy, for the Hoquiam River AU are listed in Table 5-14. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody. The 2001 Salmon and Steelhead Limiting Factors Report for WRIA 22 and 23 (Smith and Wenger) also prioritized actions as "high," "medium," or "low" for specific functions (e.g., estuary, floodplain, water quality, fish passage, sediment) by subbasin. Those restoration recommendations from Smith and Wenger (2001) that do not overlap with recommendations from the more recent Chehalis Basin Salmon Habitat Restoration and Preservation Strategy (Grays Harbor County Lead Entity 2011) are included in the tables below.

Table 5-14. Restoration Opportunities in the Hoquiam AU

Actions	Source	Priority
Actions to address water quality		
• Abandon roads in geologically sensitive areas • Implement TMDL recommendations • Identify specific degraded riparian areas for restoration; revegetate open riparian areas with native plants; revegetate riverbanks for added protection from the erosion • Protect riparian habitat on key properties • Reduce storm water discharge directly to streams. Restore wetlands for water storage • Increase hydrologic continuity - reduce impervious surfaces. Interplant conifers in deciduous dominant areas; revegetate open riparian areas with native plants	Grays Harbor Lead Entity 2011	Tier 1
• Revegetate mass-wasting areas • Protect steep and unstable slopes	Smith and Wegner 2001	High
Actions to address riparian habitat		
• Identify and revegetate degraded riparian areas • Install riparian fencing to exclude livestock • Interplant conifers in deciduous-dominated areas • Fee simple/easement protection of riparian on key properties • Remove invasive species	Grays Harbor Lead Entity 2011	Tier 1
Actions to address water quantity		
• Adjust dam flows to better accommodate fish • Implement activities that lead to natural recharge of aquifers • Increase hydrologic continuity - reduce impervious surfaces	Grays Harbor Lead Entity 2011	Tier 1

Actions	Source	Priority
Actions to address fish passage		
• Provide access above natural barriers on a case-by-case basis • Correct barrier culverts (bridges preferred) • Improve passage at dams and fishways	Grays Harbor Lead Entity 2011	Tier 1
• Open ≥3 miles of habitat for one salmonid species	Smith and Wegner 2001	High
Actions to address sediment		
• Correct cross drains on geologically sensitive slopes • Reduce road densities by abandoning and/or decommissioning roads • Remove dams where feasible • Upgrade logging roads to comply with Forest and Fish Agreement (1999)	Grays Harbor Lead Entity 2011	Tier 2
Actions to address floodplain conditions		
• Fee simple/easement protection to facilitate channel migration and floodplain reconnection • Reconnect, enhance, and restore off-channel and wetland habitat • Remove hard armoring/ implement bioengineering	Grays Harbor Lead Entity 2011	Tier 2
Actions to address LWD		
• Develop LWD supplementation plan for habitat enhancement • Install LWD in conjunction with other restoration	Grays Harbor Lead Entity 2011	Tier 3
Actions to address biological processes		
• Increase use of fish carcasses for nutrient loading	Smith and Wegner 2001	Low

5.2.6 Wishkah

Commercial timberlands predominate in the upper watershed (Wishkah-5-7, Wishkah, WF – 1 and 2, and Wishkah, EF – 2) (Photo 15). Historic splash dams and flashy flows associated with extensive forest clearing have resulted in incised, straightened channels in the upper watershed, and disruption of floodplain connectivity in the middle reaches of the watershed (Grays Harbor Lead Entity 2011). Hyporheic functions are also expected to be degraded as a result of past splash dam operation. Fish passage barriers are common throughout most reaches in the AU, with the exception of Wishkah – 4 and reaches in the East Fork Wishkah. PHS scores in Table 5-15 are largely driven by salmonid use in the Wishkah AU. Chum, coho, and Chinook salmon, bull trout, steelhead, and cutthroat trout have been documented in most of the shoreline reaches within the AU. Only cutthroat trout are documented in Wishkah – 6.

The Malinowski Dam in Wishkah – 7 forms the 2.8 acre Aberdeen Reservoir, which serves as the water supply for the City of Aberdeen (Photo 16). Dam operations may affect sediment transport.

The floodplain in Wishkah – 1 and 3, and to a lesser extent, Wishkah, EF – 1 and Wishkah – 4, is developed with agricultural, rural residential, and industrial uses (Photo 17). Total vegetation scores for these reaches, as reported in Table 5-15, result from a mischaracterization of cultivated crops as emergent wetlands in the spatial data source. Actual vegetative functions are reduced in these reaches as a result of development. In contrast, just downstream, Wishkah-2 includes broad, relatively undisturbed forested floodplain wetlands, which are expected to provide high hydrologic, hyporheic, vegetative, and habitat functions.

Figure 5-6 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Wishkah River AU are provided in Table 5-15.

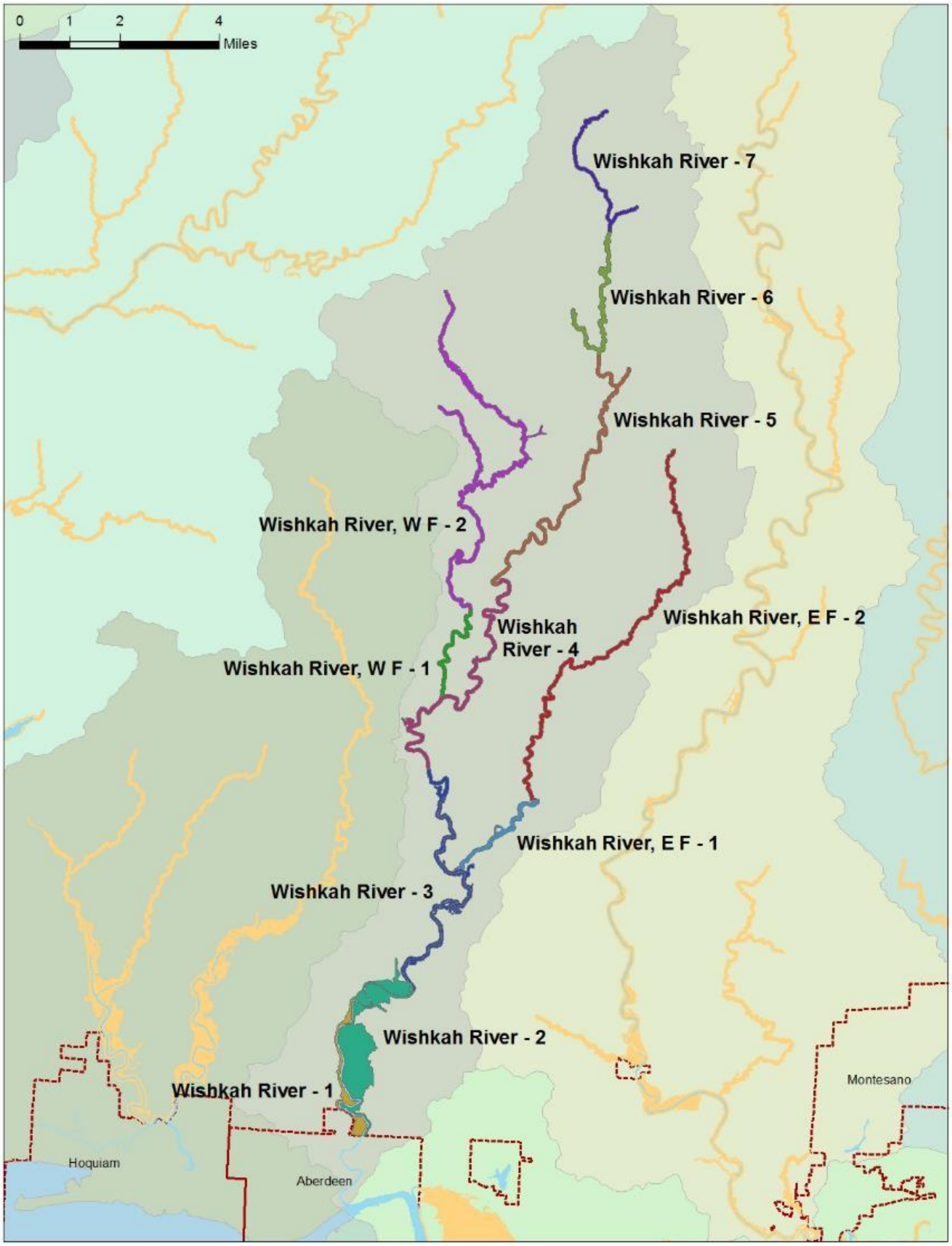


Figure 5-6. Reaches in the Wishkah AU.

Table 5-15. Reach Functional Analysis Scores in the Wishkah AU.
L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers
Wishkah River - 1	H	M	M	M	M/H	M/H	M/H	L/M	L/M
Wishkah River - 2	H	M/H	H	M/H	H	M/H	H	M/H	L/M
Wishkah River - 3	H	L/M	M	L/M	H	M/H	M	M/H	L/M
Wishkah River - 4	H	M/H	L	M/H	H	M/H	L/M	M	H
Wishkah River - 5	M/H	M/H	L	M/H	H	M/H	L	H	L
Wishkah River - 6	M	M/H	L	M/H	H	L/M	L	H	L/M
Wishkah River - 7	L	M	L	M/H	H	M	L	M	L/M
Wishkah River, EF - 1	M/H	M	L/M	M	H	M/H	L/M	M	H
Wishkah River, EF - 2	L	NA[1]	L	M/H	H	M/H	L	H	H
Wishkah River, WF - 1	M/H	H	L	H	H	M/H	L	M	L/M
Wishkah River, WF - 2	M	H	L	H	H	M/H	L	H	L/M

*In many cases in this AU, agricultural fields are classified as emergent wetlands in the spatial data source. In some cases, these areas may be farmed wetlands, which may provide similar, albeit reduced, functions. Vegetation scores may be inflated in these reaches.

Photo 15. Timberlands adjacent to upper Wishkah (Wishkah-6)

Photo 16. Location of Malinowski Dam and Aberdeen Reservoir in upper Wishkah (Whishkah-7)

Photo 17. Broad floodplain in Lower Wishkah (Wishkah-2)

Potential Restoration Opportunities

Key opportunities for restoration and protection that have been identified in the Wishkah River AU are listed in Table 5-16. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody. The 2001 Salmon and Steelhead Limiting Factors Report for WRIA 22 and 23 (Smith and Wenger) also prioritized actions as "high," "medium," or "low" for specific functions (e.g., estuary, floodplain, water quality, fish passage, sediment) by subbasin. Those restoration recommendations from Smith and Wenger (2001) that do not overlap with recommendations from the more recent Chehalis Basin Salmon Habitat Restoration and Preservation Strategy (Grays Harbor County Lead Entity 2011) are included in the tables below.

Table 5-16. Restoration Opportunities in the Wishkah AU

Actions	Source	Priority
Actions to address sediment		
• Correct cross drains on geologically sensitive slopes • Gravel enhancement downstream from dams and weirs • Reduce road density above RM 28.5 per sediment model analysis by Rayonier NW Timber Resources • Upgrade logging road to comply with 1999 Forest and Fish Agreement	Grays Harbor Lead Entity 2011	Tier 1
• Decommission roads at risk for landslides • Protect steep slopes • Revegetate exposed mass-wasting areas	Smith and Wenger 2001	High
Actions to address riparian habitat		
• Control invasive species • Identify and revegetate degraded riparian areas • Install livestock fencing in riparian areas • Interplant conifers in deciduous-dominated areas • Fee simple/easement protection of habitat on key properties	Grays Harbor Lead Entity 2011	Tier 1
Actions to address fish passage		
• Provide access above natural barriers on a case-by-case basis • Correct barrier culverts (bridges preferred)	Grays Harbor Lead Entity 2011	Tier 1
• Open ≥3 miles of habitat for one salmonid species	Smith and Wenger 2001	High

Actions	Source	Priority
Actions to address floodplain, wetland, and side channel conditions		
• Fee simple/easement protection to facilitate channel migration and floodplain reconnection • Reconnect, enhance, and restore off-channel and wetland habitat • Remove hard armoring or implement bioengineering	Grays Harbor Lead Entity 2011	Tier 2
Actions to address floodplain, wetland, and side channel conditions		
• Develop LWD supplementation plan for habitat enhancement • Install LWD as part of other projects	Grays Harbor Lead Entity 2011	Tier 2
Actions to address water quality		
• Adjust dam flows to better accommodate fish • Reduce water withdrawals from surface sources	Grays Harbor Lead Entity 2011	Tier 3
Actions to address water quantity		
• Implement activities that lead to natural recharge of aquifers	Grays Harbor Lead Entity 2011	Tier 3
• Adjust dam flow to accommodate fish • Reduce withdrawal from surface sources • Restore hydrologic continuity	Grays Harbor Lead Entity 2011	Tier 3

5.2.7 Wynoochee

The upper Wynoochee Watershed is partially located in Olympic National Forest (Wynoochee – 6 and 7, Wynoochee Lake – 1 and – 2, Anderson Creek – 1, Harris Creek – 1, Trout Creek – 1) and partially within privately owned lands managed for commercial timber (Wynoochee – Reach 5, Falls Creek – 1, Save Creek – 1, Schafer Creek – 1). Shoreline areas within Olympic National Forest provide habitat for Roosevelt elk and marbled murrelets. Several reaches in the AU are also identified as harlequin duck breeding areas (e.g., Wynoochee – 3-7, Wynoochee, WB – 1, Anderson, Big, Falls, Harris, Save, Schafer, and Wedekind Creeks), and these areas are expected to provide habitat for other waterfowl, as well.

The 172 – foot – high Wynoochee Dam, located in Wynoochee – 6, constructed in 1972, creates the 1122 acre Wynoochee Lake reservoir, and provides flood control, hydroelectric power, and water supply for the City of Aberdeen (Smith and Wenger 2001) (Photo 18). An industrial water withdrawal at RM 8.1 (Wynoochee River – 7) diverts water to Lake Aberdeen, which results in decreased summer flows and increased water temperatures (greater than 18^{o}C) (Smith and Wenger 2001). One of the objectives of the Wynoochee Dam is to provide summer flows downstream of the diversion that support salmonid migration and rearing. In order to mitigate for the fish passage barrier and altered spawning habitat created by the Wynoochee Dam, salmon and steelhead are captured at a collection facility, approximately 2 miles downstream from the dam, and transported 7.5 miles upstream, and released back in the river above the reservoir. Sediment and LWD are periodically collected and deposited below Wynoochee Dam to minimize its effects on downstream habitats (Smith and Wenger 2001). Wynoochee Lake – 1 includes a day use area and boat ramp associated with Coho Campground. The remainder of the lake (Wynoochee Lake – 2) consists of undeveloped forested lands.

The floodplain of the lower river is primarily agricultural and rural residential land (Wynoochee – 2 – 4). Forested riparian vegetation is reduced in areas of historic and ongoing agriculture.

Alluvial gravels and sandbars are plentiful in the mainstem Wynoochee River. Evidence of past and present gravel mining is present within the floodplain of Wynoochee – 2 and – 4. An active floodplain mining lake is located on the east bank of Wynoochee – 2, just north of Hwy 12. Reclaimed floodplain lakes, including one (Wynoochee Gravel Lake – 1) large enough to qualify as a Shoreline of the State, are located in Wynoochee – 2 and – 4 (Photo 19). Gravel bar mining is limited to 5,000 cubic yards on the Wynoochee River under the existing SMP.

The lowest mile of the Wynoochee (Wynoochee – 1) is tidally influenced (Smith and Wenger 2001) and surrounded by large, forested wetlands.

Tributaries to the lower river include Black, Bitter, Carter, Sylvia, and Wedekind Creeks. These tributaries, with the exception of Black Creek, are typically within areas of forestry use. Black Creek-1 and 2 include a mix of forestry, agricultural and rural residential uses (Photo 20). Riparian vegetation is sparse in several places in Black Creek- 1 as a result of clearing associated with agricultural and residential uses.

Figure 5-7 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Wynoochee River AU are provided in Table 5-17.

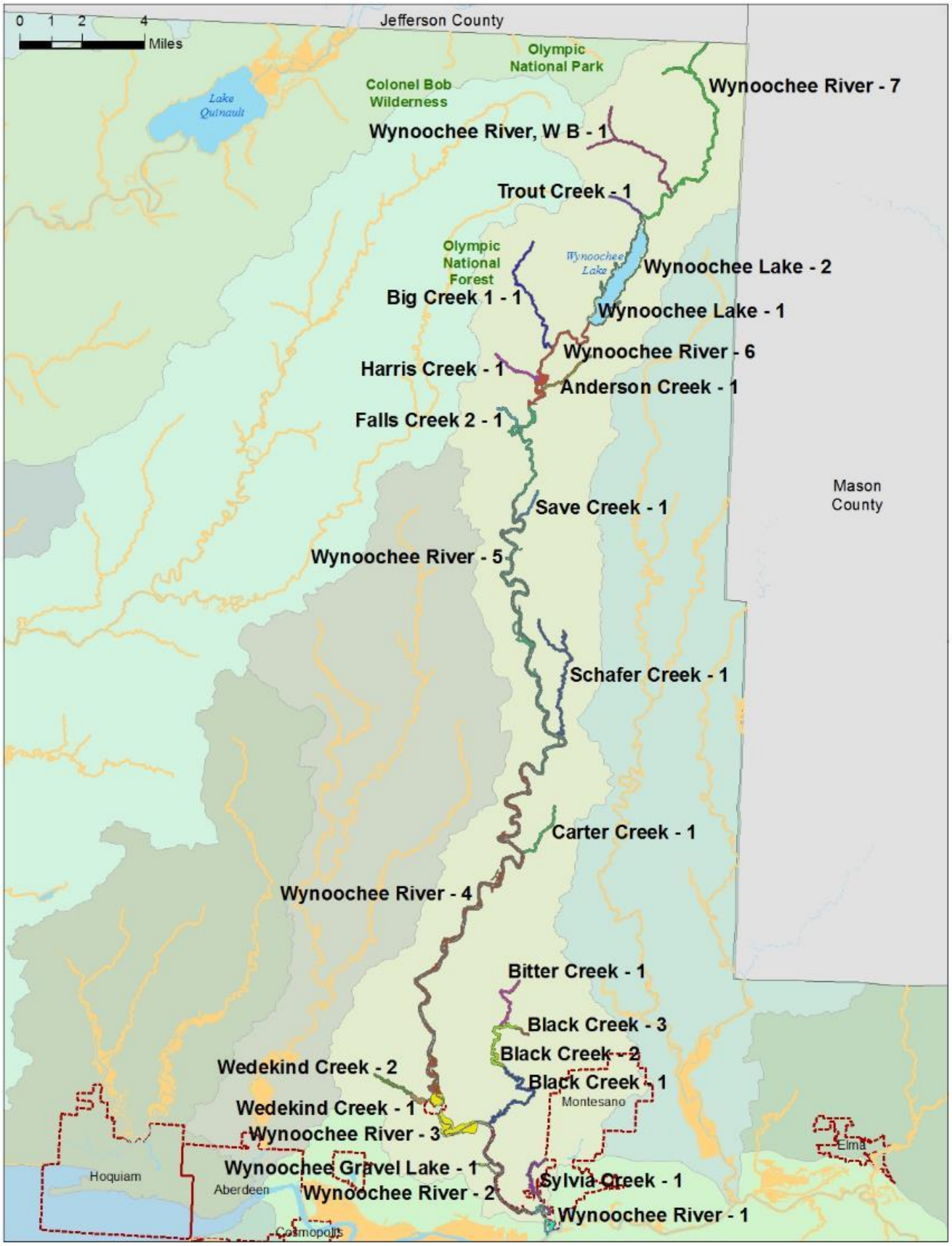


Figure 5-7. Reaches in the Wynoochee AU

Table 5-17. Reach Functional Analysis Scores in the Wynoochee AU.
L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions. Blank cells indicate data not available. ONF- Olympic National Forest.

Reach	Hydrologic			Vegetative		Habitat				
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers	Overwater Structures- Lakes
Anderson Creek - 1			L	H	H	H	L	H	H	
Big Creek 1 - 1			M	M/H	H	M/H	L	L/M	L	
Bitter Creek - 1	M/H	NA	L	H	H	M/H	L	H	H	
Black Creek - 1	M/H	L/M	L/M	M	H	M/H	L	L/M	H	
Black Creek - 2	M/H	NA	L	M	H	M/H	L	L	L/M	
Black Creek - 3	L/M	NA	L	M/H	H	M	L	H	H	
Carter Creek - 1	M	NA	L	M/H	H	M/H	L	H	H	
Falls Creek 2 - 1	M/H	NA	L	H	H	M/H	L	H	H	
Harris Creek - 1			L	H	H	M/H	L	M	L/M	
Save Creek - 1	M/H	L	L	M/H	H	M/H	L	H	H	
Schafer Creek - 1	M/H	L	L	M/H	H	M/H	L	H	H	
Sylvia Creek - 1	M/H	M/H	H	M	H	M	L	M	H	
Trout Creek – 1 (ONF)			L	M/H	M/H	M	L	L/M	L/M	
Wedekind Creek - 1	M/H	M	L	M	H	M	M	M	H	
Wedekind Creek - 2	M/H	L/M	L	H	H	M	L	H	H	
Wynoochee Floodplain Lake - 1	M/H	L	NA[1]	L/M	H	M/H	M/H	L/M	H	H
Wynoochee Lake – 1 (ONF)			NA[1]	M	H	M/H	L	L/M	H	H
Wynoochee Lake – 2 (ONF)			NA[1]	M/H	H	H	L/M	H	H	H
Wynoochee River - 1	M/H	L/M	H	M	H	M/H	M/H	L/M	H	
Wynoochee River - 2	M/H	L	H	L	M/H	H	L/M	L/M	H	
Wynoochee River - 3	M/H	L	H	L	M/H	M/H	L/M	L/M	H	
Wynoochee River - 4	M/H	L	M/H	L/M	H	H	M	M	L/M	
Wynoochee River - 5	M/H	M/H	M	M/H	H	H	L/M	H	H	
Wynoochee River – 6 (ONF)			H	M/H	H	H	M	H	H	
Wynoochee River – 7 (ONF)			M	M/H	H	H	L/M	H	L/M	
Wynoochee River, W B – 1 (ONF)			L	M/H	H	M/H	L	M	L/M	

[1] Hyporheic functions are not evaluated for lake shorelines.

Photo 18. Wynoochee Dam and Coho campground at south end of Wynoochee Lake (Wynoochee Lake-1, Wynoochee River-6)

Photo 19. Agricultural development and former and ongoing floodplain gravel mines on the Lower Wynoochee River (Wynoochee River-2, Wynoochee Gravel Lake-1)

Photo 20. Agricultural development in lower reach of Black Creek (Black Creek-1)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified, primarily in the Chehalis Basin Salmon Habitat Restoration and Protection Strategy, for the Queets River AU are listed in Table 5-18. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody. The 2001 Salmon and Steelhead Limiting Factors Report for WRIA 22 and 23 (Smith and Wenger) also prioritized actions as "high," "medium," or "low" for specific functions (e.g., estuary, floodplain, water quality, fish passage, sediment) by subbasin. Those restoration recommendations from Smith and Wenger (2001) that do not overlap with recommendations from the more recent Chehalis Basin Salmon Habitat Restoration and Preservation Strategy (Grays Harbor County Lead Entity 2011) are included in the tables below.

Table 5-18. Restoration Opportunities in the Wynoochee AU

Actions	Source	Priority
Actions to address floodplain condition		
• Add additional gravel downstream from the fish trap and dam to decrease scouring and incision areas • Reconnect, enhance, and/or restore potential off-channel, floodplain, and wetland habitat • Remove hard armoring (rip rap) or implement bioengineering techniques in place of hard armoring • Upgrade logging roads to comply with Forest and Fish Agreement (1999)	Grays Harbor Lead Entity 2011	Tier 1
Actions to address riparian habitat		
• Control invasive species • Install riparian fencing to exclude or reduce livestock access • Interplant conifers in deciduous dominant areas • Protect by fee simple or easements • Revegetate open riparian areas	Grays Harbor Lead Entity 2011	Tier 1
Actions to address fish passage		
• Correct barrier culverts • Habitat enhancement projects downstream from dam to mitigate losses • Improve fish passage at fishways and add a fishway to those structures that do not have them • Open ≥3 miles of habitat for one salmonid species	Grays Harbor Lead Entity 2011	Tier 1
Actions to address sediment		
• Abandon roads on steep geologically sensitive areas • Correct cross drains on geologically sensitive slopes	Grays Harbor Lead Entity 2011	Tier 2

Actions	Source	Priority
• Erosion control treatments along forest roads to reduce mass wasting, i.e., revegetation, bioengineering, willow cuttings • Install riparian fencing to exclude or reduce livestock access • Reduce road densities • Reduce the horse power and speed of powerboats to reduce disturbance of bank and displacement of juveniles • Revegetate riverbanks for added protection from erosion • Upgrade logging roads to comply with Forest and Fish Agreement (1999)		
Actions to address water quantity		
• Adjust dam flows to accommodate fish	Grays Harbor Lead Entity 2011	Tier 3
Actions to address water quality		
Abandon roads on steep geologically sensitive areas	Grays Harbor Lead Entity 2011	Tier 2
Actions to address LWD		
• Develop LWD supplementation plan that will install logjams in key places to improve instream channel structure and habitat diversity • Develop a method to fully replace the LWD functions that are lost as a result of the dam	Grays Harbor Lead Entity 2011	Tier 3

5.2.8 Satsop

The upper Satsop Watershed is predominantly forested and managed for timber harvest (Photo 21). Sediment loads and fish passage barriers are associated with high densities of forest roads; reduced forest cover is also associated with low base flows and high peak flows (Grays Harbor County Lead Entity 2011). Satsop, WF – 5 is located within Olympic National Forest (Photo 22). Disturbance to forest cover is low in the National Forest compared to private timber land areas; however, fish passage barriers associated with forest roads are present in shoreline jurisdiction in the National Forest (Satsop, WF – 5). Marbled murrelets have been identified near shoreline areas in the National Forest (Satsop, WF – 5). Several occurrences of western toad, a federal species of concern, have been documented along the West Fork of the Satsop River and Canyon River (Satsop, WF – 4 and Canyon River – 1).

Recent channel incision has limited floodplain and off –channel connectivity (Grays Harbor Lead Entity 2011). Historic splash damming, removal of LWD, and clear –cutting have also likely contributed to a reduction in riparian functions, limited LWD, floodplain disconnection, and reduced hyporheic activity (Grays Harbor Lead Entity 2011). Alluvial soils, broad meanders, and gravel bars are expected to contribute to hyporheic functions in Satsop – 1 and Satsop, EF – 1 and 2).

The lower watershed (Satsop – 1, Satsop, EF – 1 and 2, and Satsop, WF – 1 and 2) is predominantly in agricultural use. Riparian forest coverage along these agricultural reaches is the lowest in the watershed (Table 5 –19). Much of Satsop –1 falls within the mapped floodway, and it consists of a mixture of developed agricultural land and forested floodplain wetlands. This reach has been identified as habitat for wintering waterfowl and trumpeter swans. Wintering habitat for these species is associated with the availability of flooded agricultural fields. Riprap armoring is present in places in the lower mainstem, and a perimeter dike around the former gravel mining ponds limits flooding of approximately 40 acres in Satsop – 1. Satsop, MF – 1 and 2 are bordered by a mix of forestry, agricultural, and residential uses, and forest cover is reduced in these reaches. West Satsop Road parallels the lower reach of the West Fork Satsop River (Satsop, WF – 1), and results in several fish passage barriers to tributaries within shoreline jurisdiction.

Figure 5-8 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Satsop River AU are provided in Table 5-19.

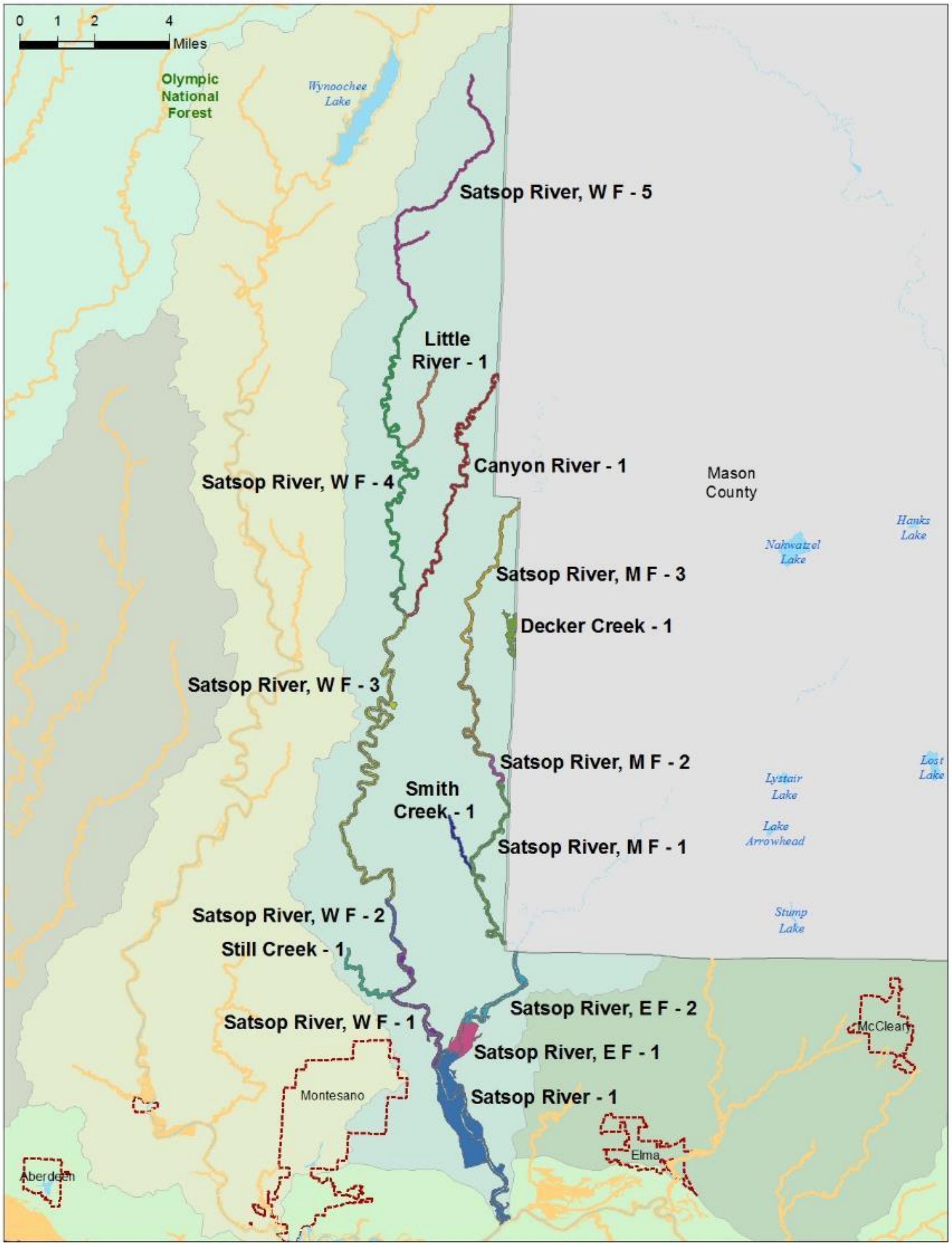


Figure 5-8. Reaches in the Satsop AU

Table 5-19. Reach Functional Analysis Scores in the Satsop AU.

L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions. Blank cells indicate data not available. ONF- Olympic National Forest.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads and Railroads	Fish Passage Barriers
Canyon River - 1	M/H	M	L	M	H	H	L	H	H
Decker Creek - 1	M	M/H	L	M	H	M/H	H	M	H
Little River - 1	L	H	L	M	H	M/H	L	H	H
Satsop River - 1	H	L/M	H	L/M	M/H	H	L/M	M	H
Satsop River, EF - 1	H	L	H	L	M/H	M/H	L	L/M	H
Satsop River, EF - 2	H	L/M	H	L/M	M/H	M/H	M	M	H
Satsop River, MF - 1	M/H	M	M	M	H	M/H	L/M	H	H
Satsop River, MF - 2	M/H	M	H	L/M	H	M/H	L/M	L/M	H
Satsop River, MF - 3	H	M/H	M	M/H	H	M/H	L	M	H
Satsop River, WF - 1	H	L/M	M	L/M	H	M/H	M	M	L
Satsop River, WF - 2	H	L/M	L/M	L/M	H	M/H	L/M	M	H
Satsop River, WF - 3	M/H	M	L/M	M	H	M/H	L/M	M	L/M
Satsop River, WF - 4	M/H	M	L/M	M/H	H	H	L	H	H
Satsop River, WF – 5 (ONF)			L	M/H	M/H	H	L	M	L/M
Smith Creek - 1	L/M	H	L	H	H	M/H	L	M	H
Still Creek - 1	L	M/H	L	M/H	H	M/H	L	M	H

Photo 21. Timberlands along the Middle Fork Satsop River (Satsop MF-1 and Smith Creek-1)

Photo 22. Minimally disturbed lands adjacent to the WF Satsop River in the Olympic National Forest (Satsop WF-5)

Photo 23. Agriculture and forested wetlands in the Satsop River floodway (Satsop River-1)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified, primarily in the Chehalis Basin Salmon Habitat Restoration and Protection Strategy, for the Satsop River AU are listed in Table 5-20. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody. The 2001 Salmon and Steelhead Limiting Factors Report for WRIA 22 and 23 (Smith and Wenger) also prioritized actions as "high," "medium," or "low" for specific functions (e.g., estuary, floodplain, water quality, fish passage, sediment) by subbasin. Those restoration recommendations from Smith and Wenger (2001) that do not overlap with recommendations from the more recent Chehalis Basin Salmon Habitat Restoration and Preservation Strategy (Grays Harbor County Lead Entity 2011) are included in the tables below.

Table 5-20. Restoration Opportunities in the Satsop AU

Actions	Source	Priority
Actions to address floodplain, wetland, and side channel conditions		
• Fee simple/easement protection to facilitate channel migration and floodplain reconnection • Reconnect, enhance, and restore off-channel, floodplain, and wetland habitat per Ralph et al. 1995; 5 identified locations along the lower 6 miles of mainstem (off-channel) • Remove hard armoring or replace with bioengineering • Relocate gravel mining away from shorelines, 100-year floodplains, and streams	Grays Harbor Lead Entity 2011	Tier 1- Mainstem
• Enhance off-channel habitat	Grays Harbor Lead Entity 2011	Tier 3- WF, MF
• Protect by fee simple or easement key properties to facilitate natural channel migration and reconnection to the floodplain. • Remove hard armoring (riprap) or implement bioengineering techniques in place of hard armoring (See Wampler 1993)	Grays Harbor Lead Entity 2011	Tier 3- EF
Actions to address riparian habitat		
• Control invasive species • Fee simple/easement protection of key properties • Revegetate riparian areas identified in 2003 Chelan Basin Lead Entity Riparian Assessment report • Interplant conifers in deciduous areas	Grays Harbor Lead Entity 2011	Tier 1- Mainstem and MF; Tier 2- WF and EF
• Develop LWD supplementation plan that will install logjams to improve habitat structure and diversity	Grays Harbor Lead Entity 2011	Tier 1- WF; Tier 2-

Actions	Source	Priority
		Mainstem and EF; Tier 3- MF
Actions to address water quality		
• Address sediment input in West Fork, Middle Fork, and East Fork • Reduce road density • Reduce exposed soils by improved logging practices	Grays Harbor Lead Entity 2011	Tier 1- Mainstem
• Reduce water temperatures – use riparian assessment to identify specific locations in Rabbit Creek	Grays Harbor Lead Entity 2011	Tier 2- MF
Actions to address sediment		
• Upgrade logging roads on Swinging Bridge Creek, middle and upper Canyon River, lower Little River, Save Creek, and Robertson Creek • Upgrade all logging roads to comply with Forest and Fish Agreement (1999)	Grays Harbor Lead Entity 2011	Tier 1- WF
• Abandon roads on steep geologically sensitive areas • Eliminate motor vehicle access to streams. • Reduce road densities by abandoning and/or decommissioning	Grays Harbor Lead Entity 2011	Tier 1- EF; Tier 2- MF
Actions to address fish passage		
• Correct barrier culverts (bridges preferred)	Grays Harbor Lead Entity 2011	Tier 1- WF, MF, EF; Tier 2- Mainstem;
• Open ≥3 miles of habitat for one salmonid species	Smith and Wenger 2001	High - Mainstem
Actions to address biological processes		
• Increase use of carcasses to increase nutrients	Smith and Wenger 2001	Low - Mainstem
Actions to address water quantity		
• Implement activities that lead for natural aquifer recharge • Increase hydrologic continuity – reduce impervious surfaces. • Reduce stormwater discharge directly to streams • Restore wetlands for water storage	Grays Harbor Lead Entity 2011	Tier 1- MF; Tier 3- Mainstem and EF
• Protect wetlands and springs	Grays Harbor Lead Entity 2011	Tier 1- WF

5.2.9 Cloquallum and Mox Chehalis

The Cloquallum and Mox Chehalis Watersheds are characterized by low gradient streams, primarily surrounded by rural residential and agricultural uses (Photo 24). Riparian forest coverage is impaired throughout the AU as a result of past timber land use and ongoing residential and agricultural uses. Forest cover is highest in Sand Creek- 1 (Table 5-21).

Vegetative cover is lowest in Wildcat Creek and its tributaries, and in Newman Creek- 2 (Table 5-21).

McCleary Pond includes a large wetland complex with intact forested buffers that likely support a variety of wildlife (Photo 25). Elsewhere within the AU, wetland area is limited. Cutthroat trout are the only priority fish species reported to use McCleary Pond.

SR 8, Elma McCleary Road, and a railroad all parallel Wildcat Creek and its tributaries, limiting functions throughout its reaches (Photo 26). The McCleary waste water treatment plant (WWTP) and cooling water from the Simpson Timber Company sawmill in McCleary discharge into the East Fork of Wildcat Creek. Impaired water quality conditions were identified for bacteria, dissolved oxygen, ammonia, temperature, and chlorine. TMDLs were developed by the McCleary WWTP and Simpson Timber to address these impairments.

Low flows are a concern in Mox Chehalis and Wildcat Creeks, which are closed to further consumptive water appropriations (Grays Harbor Lead Entity 2011).

Figure 5-9 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Cloquallum and Mox Chehalis AU are provided in Table 5-21.

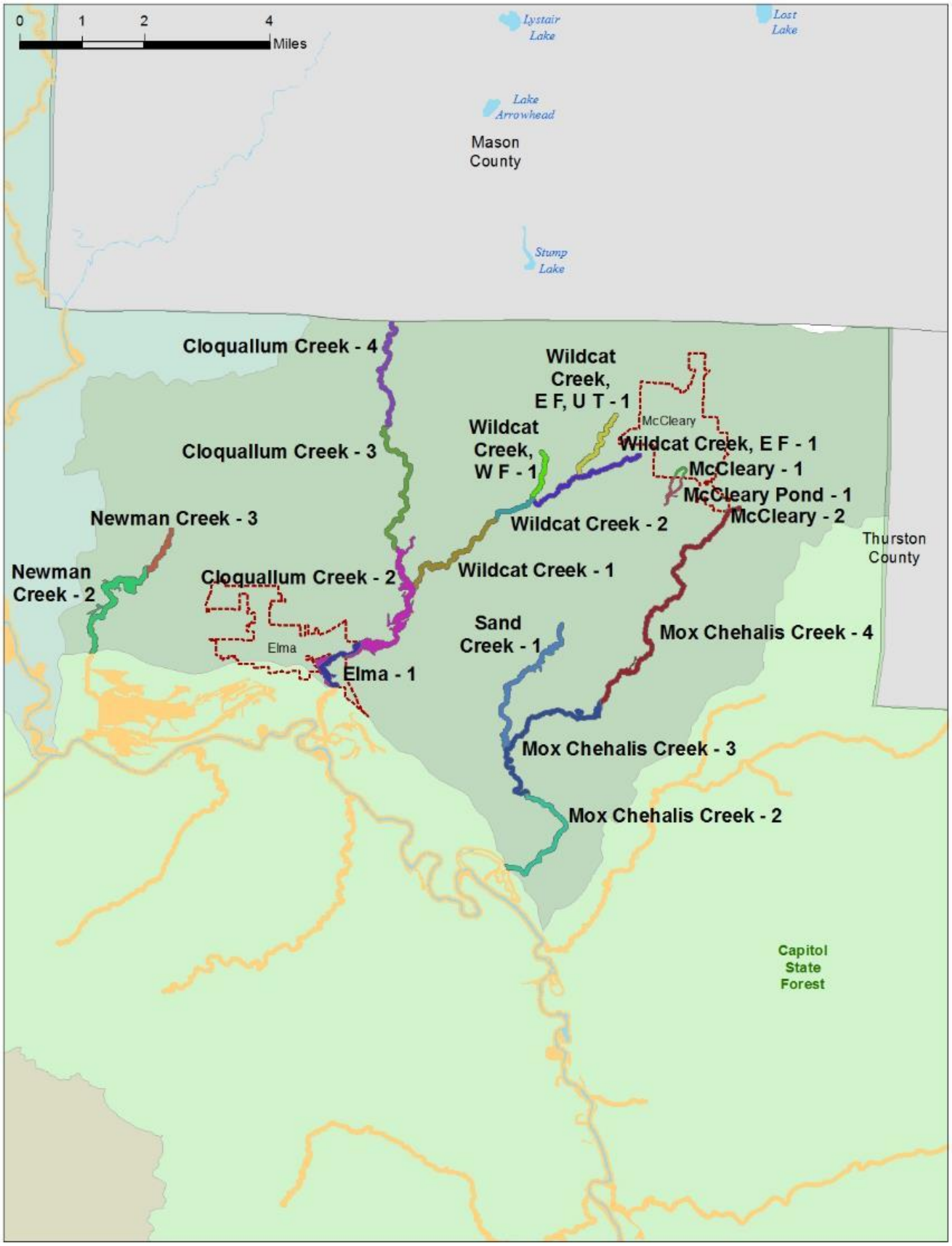


Figure 5-9. Reaches in the Cloquallum and Mox Chehalis AU.

Table 5-21. Reach Functional Analysis Scores in the Cloquallum and Mox Chehalis AU

L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads and Railroads	Fish Passage Barriers
Cloquallum Creek - 2	H	L/M	H	L/M	M/H	H	L/M	H	L/M
Cloquallum Creek - 3	L	H	L	M/H	H	M/H	L	M	H
Cloquallum Creek - 4	L	NA	L	M	M/H	M/H	L	L/M	H
McCleary Pond - 1	L/M	H	L	M/H	H	L/M	M	H	H
Mox Chehalis Creek - 2	H	M	M/H	M	M/H	M/H	L	M	H
Mox Chehalis Creek - 3	H	M	L	M	H	M/H	L	H	H
Mox Chehalis Creek - 4	M/H	L/M	M	L/M	H	M	L	L/M	H
Newman Creek - 2	H	L	M/H	L	M/H	M	L	L/M	H
Newman Creek - 3	H	M	H	M	M/H	M	L	L	H
Sand Creek - 1	H	M/H	L	M/H	H	M/H	L	M	L/M
Wildcat Creek - 1	M/H	M/L	M/H	L/M	L/M	M/H	L	L	H
Wildcat Creek - 2	M/H	L	H	L	L	M/H	L	L	L/M
Wildcat Creek, EF - 1	L	L	L/M	L/M	M	M/H	L	L/M	H
Wildcat Creek, EF, UT - 1	L	NA	L	L	L	M/H	L	L	L
Wildcat Creek, WF - 1	L	NA	H	M	M/H	M	L	H	H

[1] Hyporheic functions are not evaluated for lake shorelines.

Photo 24. Rural residential development a along Cloquallum Creek (Cloquallum-3)

Photo 25. McCleary Pond and associated wetlands (McCleary Pond-1)

Photo 26. Wildcat Creek bounded by SR 8 and Elma McCleary Road (Wildcat Creek-1)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified, primarily in the Chehalis Basin Salmon Habitat Restoration and Protection Strategy, for the Cloquallum and Mox Chehalis AU are listed in Table 5-22. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody. The 2001 Salmon and Steelhead Limiting Factors Report for WRIA 22 and 23 (Smith and Wenger) also prioritized actions as "high," "medium," or "low" for specific functions (e.g., estuary, floodplain, water quality, fish passage, sediment) by subbasin. Those restoration recommendations from Smith and Wenger (2001) that do not overlap with recommendations from the more recent Chehalis Basin Salmon Habitat Restoration and Preservation Strategy (Grays Harbor County Lead Entity 2011) are included in the tables below.

Table 5-22. Restoration Opportunities in the Cloquallum and Mox Chehalis AU

Actions	Source	Priority
Actions to address riparian		
• Control invasive species • Install livestock fencing in riparian • Interplant conifers in deciduous-dominated riparian • Protect key properties with riparian habitat • Identify specific degraded riparian areas and restore	Grays Harbor Lead Entity 2011	Tier 1
Actions to address water quantity		
• Implement activities that lead to natural aquifer recharge • Increase hydrologic continuity – reduce impervious surfaces • Reduce stormwater discharge directly to streams • Restore wetlands for water storage.	Grays Harbor Lead Entity 2011	Tier 1
Actions to address fish passage		
• Remove or correct barrier culverts (bridges preferred)	Grays Harbor Lead Entity 2011	Tier 1
Actions to address sediment		
• Abandon roads in geologically sensitive areas • Address bank erosion in fusing bioengineering approaches where property protection is desired • Minimize motor vehicle access to streams/provide education • Revegetate river banks • Upgrade logging roads to comply with 1999 Forest and Fish Agreement/other upgrades	Grays Harbor Lead Entity 2011	Tier 2

Actions	Source	Priority
Actions to address floodplain and side channel habitat		
• Protect key properties to facilitate channel migration and floodplain reconnection • Reconnect, enhance, and restore off-channel floodplain and wetland habitat • Remove hard armoring or replace with bioengineered bank stabilization	Grays Harbor Lead Entity 2011	Tier 2
Actions to address LWD		
• Develop LWD supplementation plan; use logjams and single placement, using large conifers	Grays Harbor Lead Entity 2011	Tier 3
Actions to address water quality		
• TMDL Implementation – Temperature, pH, fecal coliform	Grays Harbor Lead Entity 2011	Tier 3
Actions to address biological processes		
• Open ≥3 miles of habitat for one salmonid species	Smith and Wegner 2001	High
• Increase use of fish carcasses for nutrient loading	Smith and Wegner 2001	Low

5.2.10 Chehalis

Most of the unincorporated area adjacent to the Chehalis River between Aberdeen and Montesano (Chehalis River – 2) is owned by WDNR and managed as the Chehalis River Surge Plain Natural Area Preserve (Preserve) (Photo 27). The Chehalis River surge plain is the largest surge plain in the State. It features a large tidal wetland dominated by Sitka spruce, including diverse sloughs and islands with emergent, shrub and forested vegetation. The slow moving sloughs provide substantial off –channel habitat for anadromous salmonids and other fish species, including the Olympic mudminnow (Washington Department of Natural Resources 2009). The area is also used by bald eagles, waterfowl, and a portion of the reach is documented as a mineral site for the band –tailed pigeon. Surge plain wetlands help to attenuate flood flows during major flood events (Washington Department of Natural Resources 2009). Lands within the surge plain outside of the Preserve are primarily managed for commercial forestry, although Weyerhaeuser Company has designated part of its ownership within the surge plain as the Norm Dicks Wildlife Conservation Area (WDNR 2009). Quigg Lake (Quigg Lake – 1), within Friend's Landing, now owned by the Port of Grays Harbor, is a former floodplain gravel lake along the Chehalis River at the eastern edge of the surge plain. Chehalis River – 1 supports industrial development, including a lumber yard, as well as tidal wetlands.

Upstream of the surge plain, floodplain wetlands and oxbow channels are common on agricultural lands through the Chehalis River Valley (particularly Chehalis – 12, 14, and 19, Cloquallum – 1, Vance Creek – 1) (Photo 28). The lowermost reaches of Cloquallum, Mox Chehalis, and Newman Creek are included in this AU because they occur within the floodplain of the Chehalis River. The majority of the AU has been identified as overwintering habitat for waterfowl and trumpeter swans, and this is likely related to abundant floodplain wetlands and flooded agricultural fields. Roosevelt elk habitat is documented from Chehalis – 8-16 and the lower reaches of tributaries, including Cloquallum, Delezene, Garrard, Gibson, Mox Chehalis, Porter, and Rock Creeks. Olympic mud minnow have been found in the floodplain wetlands west of Elma in Newman Creek – 1 and Vance Creek – 1.

Alluvial soils predominate throughout the Chehalis Valley. Hyporheic activity is expected to be high, particularly in areas of broad meanders and floodplain wetlands. The Chehalis Valley has a long history of gravel mining. Vance Creek – 1 includes several former floodplain mining lakes that have been reclaimed. Moores Lake – 1 is a former floodplain mining lake that meets the minimum size of a shoreline waterbody. These lakes are typically isolated from floodplain connectivity by perimeter dikes.

Low forested riparian vegetation throughout most of the AU is associated with historic and ongoing agricultural practices in the floodplain. Reduced forested riparian cover combined with a broad channel and sediment aggradation combine to result in elevated instream temperatures (Smith and Wenger 2001). The Chehalis River and its tributaries have been identified as having impaired water temperatures, dissolved oxygen levels, and concentrations of fecal coliform bacteria. As a result, TMDLs in the upper Chehalis River (upstream from Mox Chehalis Creek) and its tributaries were established to address dissolved oxygen (2000), bacteria (2004), and temperature (2001). TMDLs were established for the lower Chehalis River and its tributaries to address fecal coliform bacteria in 2002.

Overwater structures are uncommon along the Chehalis River. A commercial loading dock and ramp associated with the Satsop Business Park is built into the bank in the western portion of Chehalis – 8. Floating docks and a boat launch in Friend’s Landing provide access to Quigg Lake and Reach 2 of the Chehalis River.

Vegetation disturbance is lowest in Chehalis – 19 and 20 in the Chehalis Indian Reservation and Harris Block State Forest (Table 5-23) (Photo 29). Porter Creek, Cedar Creek, and Rock Creek flow through Capitol State Forest and Lower Chehalis State Forest. Riparian forest cover is highest in these forestland reaches, as well as along Chehalis – 19 and 20 in the Chehalis Indian Reservation and Harris Block State Forest, respectively (Table 5-23). Riparian conditions in the lower reaches of the Black River, Porter, Garrard, Cedar and Rock Creek are limited by agricultural development and narrow buffers. Historically, there were three splash dams located on the South Fork Porter Creek, which have likely limited the quantity of LWD and the floodplain connectivity in the creek today (Smith and Wenger 2001). Porter Creek has eight sites that are armored by riprap; riprap armoring is located throughout Garrard Creek and in the lower reach of Rock Creek (Smith and Wenger 2001, Grays Harbor County Lead Entity 2011). Excessive bank erosion has been documented in Rock and Cedar Creeks (Smith and Wenger 2001).

Figure 5-10 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Lower Chehalis River AU are provided in Table 5-23.

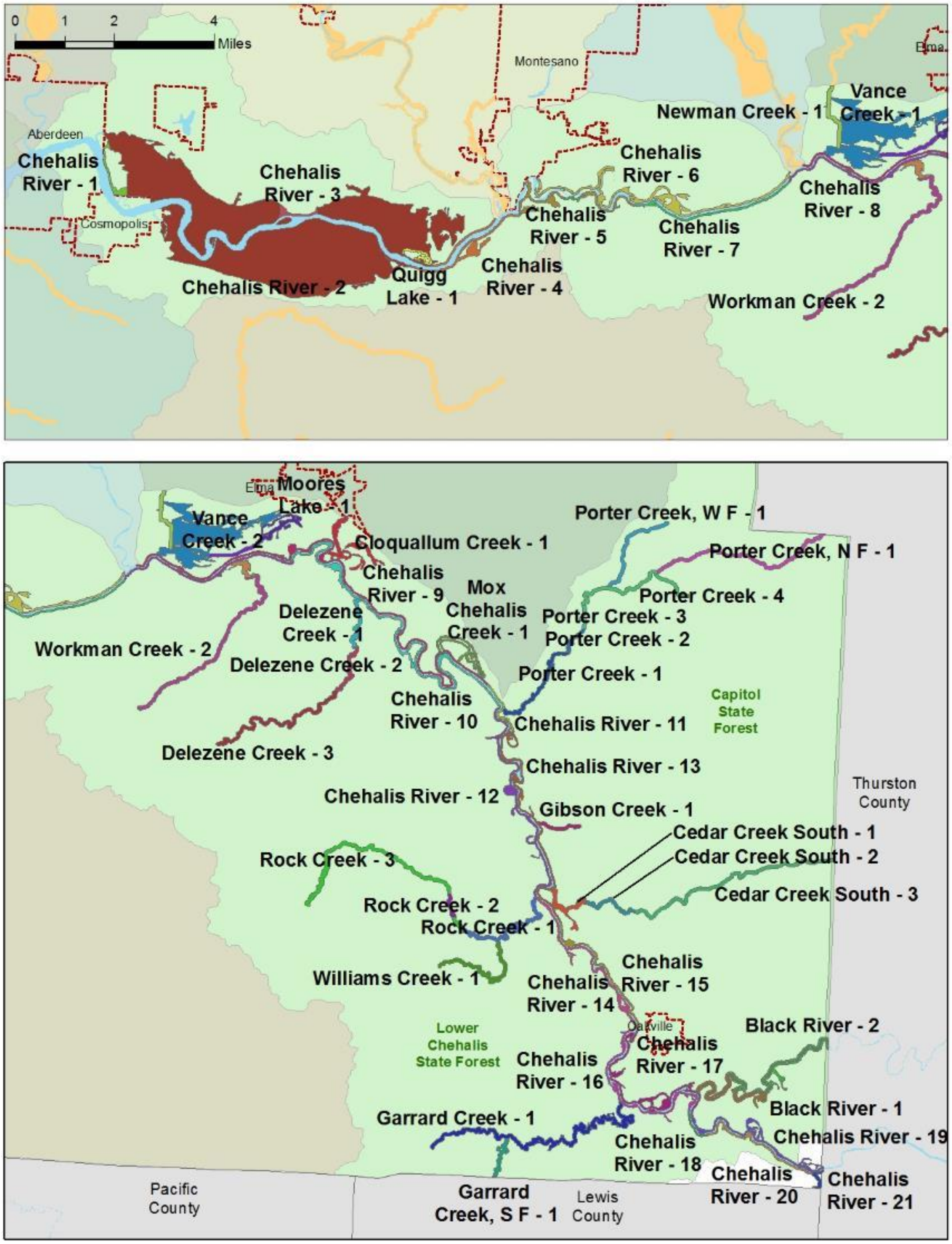


Figure 5-10. Reaches in the Chehalis AU.

Western portion of AU in top panel, and eastern portion of AU in lower panel.

Table 5-23. Reach Functional Analysis Scores in the Chehalis AU

L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitat-Regions	Wetlands	Roads and Railroads	Fish Passage Barriers
Chehalis River - 1	H	M	H	M	M/H	L/M	M/H	L/M	H
Chehalis River - 2	H	M/H	H	M/H	H	H	H	H	L
Chehalis River - 3	H	L/M	H	L/M	M	L/M	M	L	H
Chehalis River - 4	H	L/M	H	L/M	H	M/H	M	L	H
Chehalis River - 5	H	L/M	H	L/M	H	M/H	M	M	L/M
Chehalis River - 6	H	L/M	H	L/M	H	H	M	H	H
Chehalis River - 7	M/H	L/M	M/H	M	H	H	L	L	L/M
Chehalis River - 8	H	L/M	M/H	L/M	H	H	L	L/M	L/M
Chehalis River - 9	H	L/M	H	L/M	H	H	L/M	L/M	H
Chehalis River - 10	H	L/M	H	L/M	H	H	M	H	H
Chehalis River - 11	M/H	L	L/M	L	L	M/H	L	L	L/M
Chehalis River - 12	H	L/M	H	L/M	H	H	M/H	H	H
Chehalis River - 13	H	L/M	H	L/M	M/H	H	M	M	H
Chehalis River - 14	H	L	H	L	M/H	H	M/H	H	L/M
Chehalis River - 15	H	L/M	M	L/M	M/H	M/H	L/M	L/M	L/M
Chehalis River - 16	H	L/M	H	L/M	H	H	M	L/M	H
Chehalis River - 17	H	L/M	H	L/M	M/H	H	M	H	H
Chehalis River - 18	H	L/M	H	L/M	H	M/H	L	L	H
Chehalis River - 19	H	M/H	H	M/H	H	M/H	M/H	H	H
Chehalis River - 20	M/H	M/H	H	M/H	H	M/H	L/M	L	H
Chehalis River - 21	H	L	H	L	H	M/H	L	L	H
Black River - 1	H	L/M	H	L/M	H	H	L/M	H	H
Black River - 2	H	L	H	L/M	H	H	M	L/M	L
Cedar Creek South - 1	H	L	H	L	H	L/M	M	H	H
Cedar Creek South - 2	L/M	M	M	M	M/H	M/H	L	M	H
Cedar Creek South - 3	L	NA	L	M/H	M/H	M/H	L	L	H
Cloquallum Creek - 1	H	L	H	L	H	H	M/H	H	H
Delezene Creek - 1	H	M	M/H	M	M/H	H	L	M	H
Delezene Creek - 2	H	M	M/H	M	H	M/H	L	H	H
Delezene Creek - 3	L/M	M/H	M/H	M/H	H	M/H	L	L/M	L/M
Quigg Lake- 1	H	M/H	NA[1]	M/H	H	L	H	M	H
Garrard Creek - 1	H	L	H	L	H	M/H	L	M	H

Reach	Hydrologic		Hyporheic- Alluvium	Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain		Forest cover	Total vegetation cover	Priority Habitat-Regions	Wetlands	Roads and Railroads	Fish Passage Barriers
Garrard Creek, SF - 1	M/H	L/M	H	L/M	H	M/H	L/M	H	H
Gibson Creek - 1	M	M	L/M	M	M/H	M/H	L	L/M	H
Moores Lake - 1	H	L/M	NA[1]	L/M	M	M/H	M/H	L/M	L/M
Mox Chehalis Creek - 1	H	L	H	L	M/H	H	L/M	L	H
Newman Creek - 1	H	L	H	L	M/H	H	L	L	H
Porter Creek - 1	M/H	L/M	M/H	L/M	H	M/H	L	M	L/M
Porter Creek - 2	M/H	H	M	H	H	M/H	L	M	H
Porter Creek - 3	M	H	L	M/H	H	M/H	L	L/M	H
Porter Creek - 4	L	NA	L	M/H	H	M/H	L	L/M	H
Porter Creek, NF - 1	L	NA	L	M/H	H	M/H	L	H	H
Porter Creek, WF - 1	L	NA	L	M/H	H	L/M	L	H	H
Rock Creek - 1	M/H	L/M	H	L/M	H	H	L	H	H
Rock Creek - 2	M/H	H	H	H	H	M/H	L	M	H
Rock Creek - 3	L/M	H	M	H	H	M/H	L	H	H
Vance Creek - 1	H	L	H	L	H	H	H	M	L/M
Vance Creek - 2	H	L	H	L	H	M/H	L/M	H	H
Williams Creek - 1	M/H	M	H	M	H	M	L	M	H
Workman Creek - 1	H	L	H	L	H	M/H	L	H	H
Workman Creek - 2	L	H	M	M/H	H	M	L	L/M	H

[1] Hyporheic functions are not evaluated for lake shorelines.

Photo 27. Chehalis River surge plain (Chehalis-2)

Photo 28. Agricultural uses and oxbow channels along the Chehalis River (Chehalis-12 and 13)

Photo 29. Forested areas adjacent to the Chehalis River in the Chehalis Indian Reservation and Harris Block State Forest (Chehalis- 19 and 20)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified, primarily in the Chehalis Basin Salmon Habitat Restoration and Protection Strategy, for the Chehalis River AU are listed in Table 5-24. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody. The 2001 Salmon and Steelhead Limiting Factors Report for WRIA 22 and 23 (Smith and Wenger) also prioritized actions as “high,” “medium,” or “low” for specific functions (e.g., estuary, floodplain, water quality, fish passage, sediment) by subbasin. Those restoration recommendations from Smith and Wenger (2001) that do not overlap with recommendations from the more recent Chehalis Basin Salmon Habitat Restoration and Preservation Strategy (Grays Harbor County Lead Entity 2011) are included in the tables below.

Table 5-24. Restoration Opportunities in the Chehalis AU

Actions	Source	Priority
Actions to address riparian		
• Control invasive species in riparian • Identify and revegetate degraded riparian areas • Exclude livestock from riparian with fencing • Interplant conifers in deciduous-dominated riparian • Protect key riparian properties • Implement alternative methods of bank stabilization (bioengineering) in locations of excessive erosion (Black River) • Restore riparian corridor at RM1.4-3.1, RM 4-5.2, and RM 6.5-7.6 of Garrard Creek • Restore riparian corridor along Rock Creek from RM 1.5-2.9 and Williams Creek from RM 0-1 and RM 2.2-3.8)	Grays Harbor Lead Entity 2011	Tier 1-Chehalis, Black, Porter, and Garrard; Tier 2-Rock/Williams
• Restore tidal wetlands	Mobrand Biometrics 2003	Based on availability and feasibility
• Identify funding and easement opportunities for mid-to-late seral stages	Smith and Wegner 2001	
Actions to address water quality		
• TMDL implementation for temperature, pH, and coliform	Grays Harbor Lead Entity 2011	Tier 1-Chehalis
• Reduce livestock access to Garrard Creek		Tier 2-Garrard
• Determine water quality conditions in Porter Creek		Tier 3- Porter

Actions	Source	Priority
• Restore wetlands and off-channel habitat • Reduce groundwater inputs near urban areas, addressing septic and agricultural practices near Montesano, Elma, Chehalis Indian reservation	Smith and Wegner 2001	
Actions to address floodplain and side channel habitat		
• Protect key properties to facilitate channel migration and floodplain reconnection • Reconnect and restore off-channel habitat • Relocate gravel mining away from shoreline and out of 100-year floodplain (Chehalis) • Implement bioengineering for bank stabilization	Grays Harbor Lead Entity 2011	Tier 1- Chehalis; Tier 2- Porter Creek; Tier 3- Black River
Develop LWD supplementation plan and install LWD where appropriate		Tier 1- Rock/Williams
• Implement bioengineering for bank stabilization		Tier 3- Garrard Creek
• Take restoration actions to address channel incision	Smith and Wenger 2001	
Actions to address LWD		
• Develop LWD plans where levels are low • Install log jams and single placement with large conifers	Grays Harbor Lead Entity 2011	Tier 1- Porter; Tier 2- Chehalis and Black River; Tier 3- Garrard
• Increase natural LWD recruitment through riparian restoration	Smith and Wenger 2001	
Actions to address water quantity		
• Reduce impervious surface • Reduce stormwater discharge to streams • Reduce surface source withdrawals • Restore wetlands for water storage	Grays Harbor Lead Entity 2011	Chehalis- Tier 2
• Implement forest practice rules in forested headwaters to eliminate ditchwater connection to live streams • Re-create wetlands in the lower and middle reaches		Tier 2- Garrard; Tier 3- Rock/ Williams
• Encourage and reward water conservation efforts	Smith and Wenger 2001	
Actions to address fish passage		
• Remove or correct barrier culverts	Grays Harbor Lead Entity 2011	Tier 1- Porter, Garrard and Rock/Williams; Tier 2- Black

Actions	Source	Priority
• Open ≥3 mi of quality habitat for at least one salmon/steelhead stock • Use bridges or fish-passable culverts • Address water temperate blockages during summer and low flow	Smith and Wenger 2001	
Actions to address sediment		
• Reduce stream reach erosion at sites identified by Wampler et al. (1993) in upper reaches of Garrard and Kellog Creeks and in middle and upper reaches of Williams and Rock Creeks	Grays Harbor Lead Entity 2011	Tier 1- Garrard and Rock/Williams
• Work with landowners to reduce livestock access to Porter, Rock and Williams Creeks		Tier 1- Rock/ Williams; Tier 2- Porter;
• Upgrade logging roads to comply with 1999 Forest and Fish Agreement		Tier 3- Chehalis
• Provide landowner incentives to preserve spawning areas • Rehabilitate unused roads	Smith and Wenger 2001	
Actions to address biological processes		
• Increase use of fish carcasses	Smith and Wenger 2001	

5.2.11 North River

The North River AU consists mostly of private forest lands. Riparian forest cover is high along most shoreline watercourses (Photo 30), except that lower riparian forest cover is observed on Pioneer Creek-1 and Raimie Creek – 1, where clearcuts partially extend into the mapped shoreline jurisdiction (Table 5-25) (Photo 31). Forest cover is also lower in areas of rural residential development near the Town of Artic (North River – 3 and 4) (Table 5-25) (Photo 32). Wetland area is naturally low in these upper watershed reaches. Water temperatures are identified as impaired in these reaches, as well as just upstream in Salmon River – 1 (Washington Department of Ecology 2012). Habitat, forest cover, and water quality in North River – 4 are also impaired by Artic Road, which closely parallels much of the reach. Roads, railroads, and forestry uses have resulted in numerous landslides in the North River AU (Smith 1999).

Most reaches in the AU are used by coho, Chinook, and chum salmon, steelhead, and cutthroat trout. Marbled murrelet occurrences have been documented within or near shorelines in North River – 2 and 5, Little North River – 1, Lower Salmon Creek – 1. North River – 5 and Raimie Creek – 1 also include wintering habitat for Roosevelt elk.

Figure 5-11 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the North River AU are provided in Table 5-25.

Figure 5-11. Reaches in the North River AU.

Table 5-25. Reach Functional Analysis Scores in the North River AU.
L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions.

Reach	Hydrologic			Vegetative		Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Priority Habitats and Species	Wetlands	Roads and Railroads	Fish Passage Barriers
Elkhorn Creek - 1	L	NA	L	M/H	H	M	L	H	H
Little North River - 1	M	M/H	M/H	M/H	H	M/H	L	M	H
Lower Salmon Creek - 1	M	M	L/M	M/H	H	H	L	M	H
North River - 1	M/H	H	L	H	H	M/H	L/M	H	H
North River - 2	M/H	H	M/H	H	H	M/H	L	H	H
North River - 3	H	M/H	M/H	M/H	H	M/H	L	H	H
North River - 4	M/H	M	M/H	M	H	M/H	L	L/M	H
North River - 5	H	M/H	H	M/H	H	H	L/M	M	L/M
Pioneer Creek - 1	M	M/H	L/M	M	H	M/H	L/M	M	H
Raimie Creek - 1	L	NA	M	M	H	M/H	L	H	H
Salmon Creek - 1	M	H	L	M/H	H	M/H	L	M	H
Vesta Creek - 1	M/H	H	M/H	H	H	M/H	L/M	M	H

Photo 30. Forested timberlands along North River (North River-2)

Photo 31. Clear cutting along Raimie Creek that partially extends into shoreline jurisdiction (Ramie Creek-1)

Photo 32. North River bounded by Artic Road and rural residential development (North River-3)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified in the Pacific County (WRIA 24) Strategic Plan for Salmon Recovery for the North River AU are listed in Table 5-26.

Table 5-26. Restoration Opportunities in the North River AU

Actions	Source
• Decommission roads and replace or remove culverts that create fish passage barriers • Place LWD in areas deficient in spawning gravel • Plant conifers in open areas or deciduous forests	AES 2001

5.2.12 South Grays Harbor Tributaries

The majority of the basin is managed as commercial timberlands, with rural residential development concentrated in the lower reaches near the highway. This AU has some of the highest road densities in the Chehalis Basin, resulting in many fish passage barriers (Grays Harbor Lead Entity 2011). Several passage barriers associated with culverts at road crossings are located in shoreline jurisdiction in Newskah Creek – 2 and Johns River – 2.

A combination of estuarine and diked freshwater wetlands occur in the lower reaches of the South Grays Harbor tributaries. Fish passage barriers in Johns River – 1 tend to be associated with tide gates; recent dike breaches on the right bank (looking downstream) of Johns River – 1 have improved estuarine wetland connectivity and reduced fish passage barriers there (Photo 33). Dikes remain on the left bank, and this area is managed for freshwater wetland habitat (Photo 33). A dike was also breached in lower Newskah Creek in the 1990s, improving estuarine connectivity there (Smith 1999) (Photo 34).

The Elk River Natural Resources Conservation Area (NRCA) includes Johns River – 1, Elk River – 1, and Andrews Creek – 1. These areas are managed for salt marsh, waterfowl, and Roosevelt elk habitat.

Forest lands in Johns River – 3 and Elk River – 2 include areas with numerous documented occurrences of threatened marbled murrelets (Photo 35).

The shoreline watercourses in this AU are included in a TMDL to address elevated fecal coliform bacteria levels in Grays Harbor (Washington Department of Ecology 2004).

Figure 5-12 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the South Grays Harbor Tributary AU are provided in Table 5-27.

Figure 5-12. Reaches in the South Grays Harbor Tributaries AU.

Table 5-27. Reach Functional Analysis Scores in the South Grays Harbor Estuary AU.
L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions. Blank cells indicate no data available.

Reach	Hydrologic			Vegetative			Habitat			
	Floodplain/Floodway	Forested vegetation in floodplain	Hyporheic- Alluvium	Forest cover	Total vegetation cover	Marine vegetation[1]	Priority Habitats and Species	Wetlands	Roads and Railroads	Fish Passage Barriers
Andrews Creek - 1	M/H	M	H	M/H	M/H		M	L	L	H
Charley Creek - 1	H	L/M	H	L/M	M/H		M	M/H	H	H
Charley Creek - 2	M/H	M/H	L	M/H	H		L/M	L	L/M	H
Elk River - 1	M/H	H	H	H	H	H	M/H	H	H	H
Elk River - 2	M/H	H	H	H	H		H	M	H	H
Johns River - 1	H	L	H	L/M	H	M	M/H	H	H	L
Johns River - 2	M	H	L	M/H	H		L/M	H	H	H
Johns River - 3	M	M/H	H	M/H	M/H		M/H	M	M	L
Johns River - 4	M/H	H	H	M/H	H		H	L	H	H
Newskah Creek - 1	H	M/H	H	M/H	H	M	M/H	H	H	H
Newskah Creek - 2	M/H	M/H	M/H	M/H	H		M	L/M	M	L

Photo 33. Combination of diked and undiked wetlands in lower Johns River (Johns River-1)

Photo 34. Area of previous dike break at Newskah River (Newskah River-1)

Photo 35. Densely forested areas along upper Elk River, where marbled murrelets have been documented (Elk River-3)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified in the Chehalis Basin Salmon Habitat Restoration and Protection Strategy for the South Grays Harbor Tributary AU are listed in Table 5-28. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody.

Table 5-28. Restoration Opportunities in the South Grays Harbor Tributaries AU

Actions	Source	Priority
Actions to address fish passage		
• Correct barrier culverts	Grays Harbor Lead Entity 2011	Tier 1
Actions to address sediment		
• Reduce sediment loading by reducing road densities • Revegetate streams/riverbanks for added erosion protection • Upgrade logging roads to comply with Forest and Fish Agreement (1999)	Grays Harbor Lead Entity 2011	Tier 1
Actions to address riparian		
• Interplant conifers in deciduous dominant areas where appropriate • Protect (fee simple or easements) key properties of riparian habitat • Remove invasive species	Grays Harbor Lead Entity 2011	Tier 1
Actions to address LWD		
• Develop LWD supplementation plan that will install logjams in key places to supplement low densities in middle and lower watershed • Install LWD pieces in conjunction with other restoration	Grays Harbor Lead Entity 2011	Tier 2
Actions to address floodplain		
• Reconnect, enhance, and or restore potential off-channel, floodplain, and wetland habitat	Grays Harbor Lead Entity 2011	Tier 2
Actions to address water quality		
• Implement TMDL recommendations	Grays Harbor Lead Entity 2011	Tier 3

5.2.13 Pacific Coast

Similar to other shorelines in the County, reach breaks on the Pacific Coast were driven by changes in land use (ownership, current use, zoning, comprehensive plan designation), and further directed by transitions in shoretypes and major river mouths (described in Secition

5.1.1). Within the QIR, the Pacific Coast shoreline is predominantly undeveloped, with the exception of the Town of Taholah. North of Point Grenville (Pacific Coast – 1 and 2), the coast is composed of narrow beaches backed by steep cliffs with forested vegetation (Photo 26). Shoreline armoring is present along the coast where development or roads occur at river and stream mouths at Taholah (Pacific Coast – 1), Wreck Creek (Pacific Coast-3), Moclips (Pacific Coast – 4), and Joe Creek (Pacific Coast – 4 and 5). Vegetation scores in Table 5-29 are skewed downward because the analysis area includes unvegetated beaches. South of Point Grenville (Pacific Coast – 3-10), the nearshore environment in Grays Harbor County is characterized by long stretches of sand beaches with low-lying dunes with herbaceous and shrub vegetation. Interdunal wetlands are mapped in Reaches 7, 9, and 10. The habitat significance of these interdunal wetlands is discussed above in Section 3.4.2. Forest cover in Pacific Coast-3-10 is low, even though total vegetation coverage is high (Table 5-29). Salt marsh vegetation is present at river and stream mouths in Pacific Coast – 1-7. Pacific Coast – 8-10 do not have stream mouths to support salt marsh vegetation.

State Route 109 closely parallels the coast in the southern portion of the QIR (Pacific Coast- 3), contributing to armored shorelines and fish passage barriers at several small tributaries. The County's unincorporated outer coast south of Moclips (Pacific Coast – 4-10) is predominantly developed by rural residential and recreational uses. Residential development is generally setback behind coastal vegetation. In Moclips (Pacific Coast – 4), limited vegetation separates development from the beach (Photo 37). Beach access points and campgrounds in Pacific Coast – 7-10 experience concentrated impacts from human uses (e.g., trampling of dunes and vehicle use) (Photo 38).

The Pacific Coast beaches provide habitat for shorebirds, bald eagles, and razor clams (Pacific Coast – 4-10). Marbled murrelets have been observed in Pacific Coast Reaches – 1, 4, 6, and 10. Although not reflected in the habitat score, Copalis Spit (Pacific Coast- 6) provides significant habitat function, as it is the northern-most designated Critical Habitat for the western snowy plover (Federal Register 2012). The Connor Creek mouth migrated north significantly between 1997 and 2006, cutting off a previous vehicular access point to the beach, as apparent in the oblique photographs in Figure 5-13. The northward migration of Connor Creek limits vehicular access and associated impacts to Copalis Beach in Pacific Coast – 6.

Figure 5-14 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Pacific Coast AU are provided in Table 5-29.

Figure 5-13. Aerial view of change in Connor Creek mouth from 1997 to 2006.
(Source: Washington Department of Ecology, electronic reference)

The entire Pacific Coast shoreline is used for recreational shellfish harvest. The QIN manages both a commercial and subsistence razor clam fishery within the QIR. The QIN's Quinault Pride Seafood Company is the only business on the Washington coast that commercially cans razor clams.

Offshore conditions and functions tend to be more consistent throughout the County compared to shoreline conditions, which are more directly influenced by common land use changes. The most significant differentiating feature within the offshore area is the occurrence of rocky reef outcroppings north of Point Grenville and south of the mouth of the Quinault River. These outcroppings may support rockfish species and other species that are associated with benthic habitat structure. Other offshore areas in the County would tend to support bottomfish and pelagic species. The offshore area within the County's jurisdiction supports commercial

Dungeness crab fishing, recreational and charter salmon fishing, and recreational and charter bottomfish and lingcod fishing (Washington Marine Spatial Planning, electronic reference).

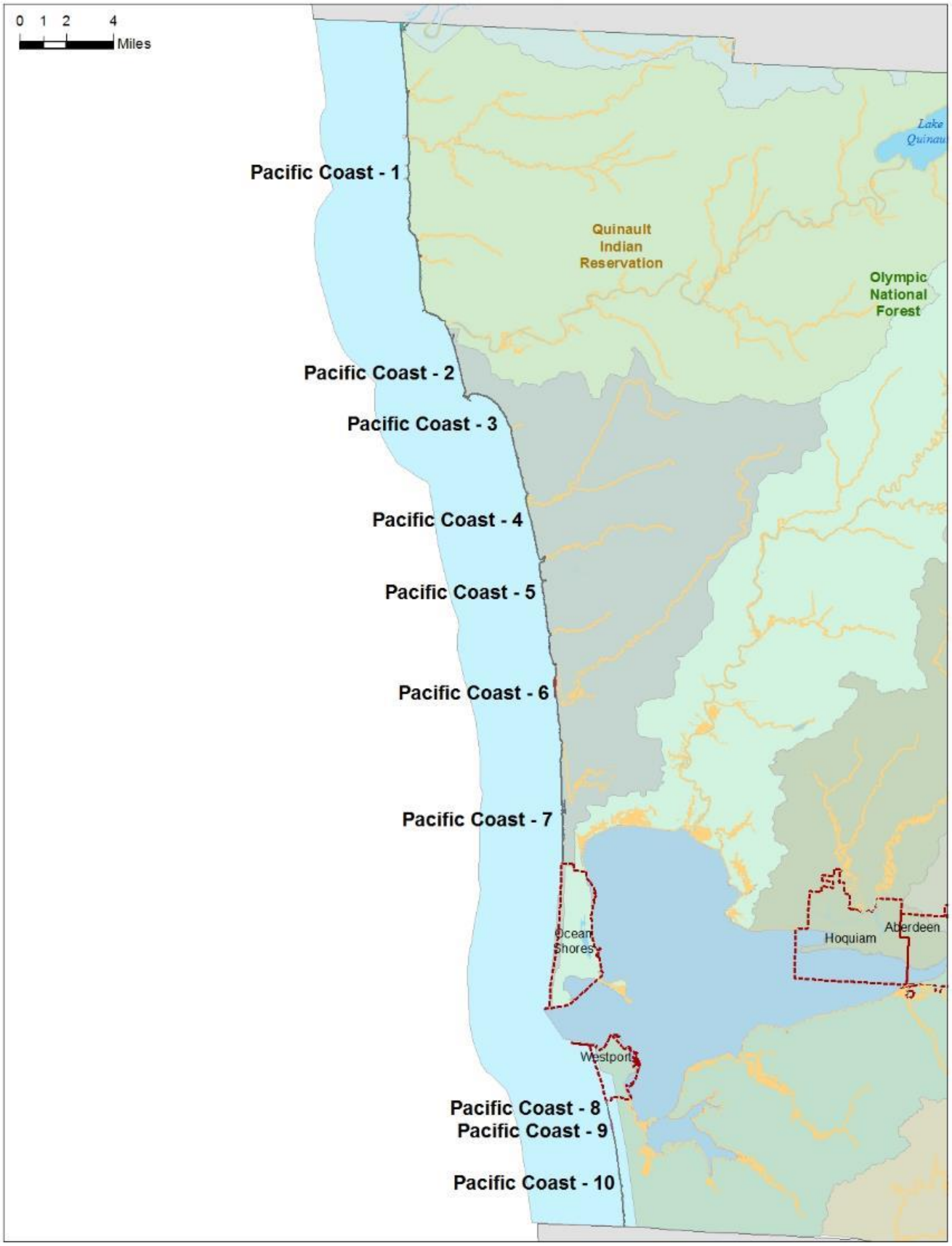


Figure 5-14. Reaches along the Pacific Coast.

Table 5-29. Reach Functional Analysis Scores in the Pacific Coast AU.

L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions. QIR- Quinault Indian Reservation.

Reach	Hydrologic	Vegetative			Habitat			
	Shoreline Armoring	Forest cover	Total vegetation cover	Marine vegetation	Priority Habitats and Species	Wetlands	Roads and Railroads	Fish Passage Barriers
Pacific Coast – 1 (QIR)	M/H	L/M	L/M	H	H	L/M	H	H
Pacific Coast – 2 (QIR)	H	L	L/M	H	L/M	L	H	H
Pacific Coast – 3 (QIR)	M/H	L/M	M/H	H	M/H	L	M	L
Pacific Coast - 4	M/H	L	M	M	M	L	L	H
Pacific Coast - 5	M/H	L/M	M/H	M	M/H	L	L/M	H
Pacific Coast - 6	H	L	M/H	H	M/H	M	H	H
Pacific Coast - 7	H	L	H	M	M	L/M	H	H
Pacific Coast - 8	H	L	H	L	L/M	L	H	H
Pacific Coast - 9	H	L	M/H	L	L/M	L	H	H
Pacific Coast - 10	H	L	M/H	L	H	L/M	H	H

Photo 36. Bluff-backed beaches typical of the Pacific Coast in the northern portion of the County in the QIR (Pacific Coast-1) (photo by Ecology)

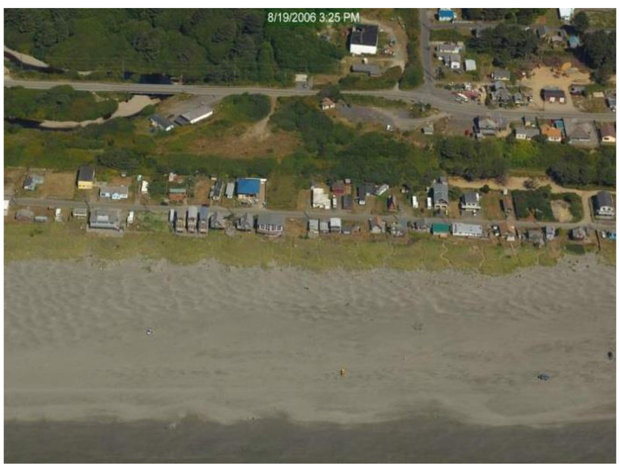


Photo 37. Shoreline residential development in close proximity to the beach in Moclips (Pacific Coast-4) (photo by Ecology)

Photo 38. Sand dunes and beach access along the Pacific Coast south of Westport (Pacific Coast-10) (photo by Ecology)

Potential Restoration Opportunities

Key opportunities for restoration and protection that have been identified in the Pacific Coast AU based on an understanding of existing and anticipated future threats to shoreline functions are listed in Table 5-30.

Table 5-30. Restoration Opportunities along the Pacific Coast AU

Actions
• Implement the monitoring, water quality improvement, and outreach actions identified in the North Beach Shellfish Protection District Program • Continue derelict fishing gear reporting and removal programs • Protect low-lying shorelines and coastal lands vulnerable to erosion through acquisition or easements to limit land use conflicts and increase coastal resilience to sea level rise and other climate-related changes • Protect high-quality habitat areas from new human disturbances.

The North Beach Shellfish Protection District Program, established in 2012, extends from Point Grenville in the north to Ocean Shores in the south (Grays Harbor County 2012). Implementation of the NBSPD will involve coordination with representatives from State agencies, the QIN, and the City of Ocean Shores to identify and address potential sources of bacteria. Grays Harbor County will continue to monitor freshwater sources near impaired marine sampling stations. It will also begin to inventory smaller drainages along the growing area, noting the location of properties served by septic systems. The County will also engage in public outreach and education efforts to maintain water quality conditions.

5.2.14 Grays Harbor Estuary

The Grays Harbor Estuary supports numerous tidal marshes and mudflats. These habitats provide nesting and foraging opportunities for shorebird assemblages, birds of prey, juvenile salmonids, and other fish species. The area west of South Arbor (Grays Harbor – 11), Beardsley Slough (Grays Harbor – 16), Grass Island (Grays Harbor – 17), and Damon Point (Grays Harbor – 19) also support eelgrass beds, which provide nursery habitats for a range of aquatic species.

Some of the least developed shorelines along Grays Harbor are found in North Bay (Grays Harbor –1 and 2) (Photo 39), Beardsley Slough (Grays Harbor – 16), and Damon Point (Grays Harbor – 19) (Photo 40). These reaches do not have shoreline armoring or fish passage barriers, and they have few, if any, roads in shoreline jurisdiction. North Bay is characterized by undeveloped forested and emergent wetlands. Parcels in North Bay (Grays Harbor – 2) are large, and most are under State (WDNR) or conservation (Forterra) ownership. In contrast, North Bay in Grays Harbor – 1 is divided into numerous small lots under private ownership, including several wholly within the mapped wetlands. Shorelands in Beardsley Slough (Grays Harbor – 16) are predominantly forest lands in State (WDNR) ownership. Extensive salt marsh channels are located waterward of the OHWM in this reach. Damon Point (Grays Harbor –19) is a large sand spit with patchy scrub –shrub vegetation. Damon Point was managed by Washington State Parks until 2009, when it was returned to WDNR (Kathryn Scott, Washington State Parks, personal communication, April 3, 2014). Although not reflected in the habitat scoring, Damon Point provides important habitat features, as it is frequented by snowy owls in the winter, and it is one of two locations in the County with designated Critical Habitat for federally threatened western snowy plover (Federal Register 2012), and it includes the northernmost designated critical habitat for the federally threatened streaked horned lark (Federal Register 2013).

Other high –quality habitat areas in Grays Harbor that are currently in conservation or public ownership are found in the following reaches: Grays Harbor – 4 (Grays Harbor Audubon and WDFW), Grays Harbor – 7 (Grays Harbor Audubon), Grays Harbor –9 (WDFW), Grays Harbor – 11 (WDFW), and Grays Harbor – 14 (WDNR). These protected areas include high functioning and diverse habitat areas including tidal channels, forested wetlands, forested shorelines, and river and stream mouths.

In 1982, Simenstad et al. estimated that shoreline modifications in the form of fill and diking have resulted in a loss of approximately 30% of historic estuary habitats. Several dike breaches have occurred in Grays Harbor, and as a result, it is expected that a significant portion of that area has returned to estuarine marsh habitats, although no recent estimate has been identified. Grays Harbor – 7, 13, and 17 each have dikes with breaches that significantly reduce, but do not eliminate, the hydrologic impairment caused by the dike and improve hydrologic connectivity, as well as vegetative and habitat functions in the reaches. The dike in Grays Harbor – 7 was breached as a part of a recent mitigation project, resulting in the tidal inundation of a 60 –acre property owned by the Washington Department of Transportation. Despite the breaches in the dike at Redman Slough (Grays Harbor – 13), a derelict concrete structure associated with a former tidegate and hundreds of large, truck tires used for shoreline armoring along over 1,000 feet of shoreline east of Bottle Beach State Park remain (Photo 41). At the mouth of the Johns River (Grays Harbor – 13), an armored groin extends into the western bank. Other reaches have riprap armoring or armored berms, which are associated with the former railroad (e.g., Grays Harbor – 7-11) or existing roads (e.g., Grays Harbor – 4 for Burrows Road, Grays Harbor –8 for Highway 109 and Grays Harbor – 9, 15 and 18 for Highway 105). Residential bulkheads are relatively less common, but they do occur, specifically in Grays Harbor – 6, 10, 15, and 18.

Overwater structures and derelict piles are commonly located at the mouths of sloughs, including Campbell's Slough and Jessie's Slough (Grays Harbor- 4), Grass Creek (Grays Harbor- 7), near Newskah Creek (Grays Harbor- 9), and Johns River (Grays Harbor- 12).

Whereas most overwater structures appear to be in use associated with aquaculture or residential uses; removal of derelict piles could be considered.

Figure 5-15 depicts the general location of reaches; additional detail on reach locations can be found in maps in Appendix B. Quantitative metrics of functional indicators for reaches in the Grays Harbor Estuary AU are provided in Table 5-31.

In addition to shoreline reaches, within Grays Harbor Estuary, islands and sandbars provide habitat for several species of shorebirds. These areas include Sand Island, Goose Island, and Whitcomb Flats, each identified as a Natural Area Preserves (NAPs) by WDNR. Additionally, submerged and intertidal mudflats are used for shellfish aquaculture. As noted in Section 3, a deep draft channel extends through Grays Harbor from the bar offshore of the jetties to Cosmopolis, WA. The navigational channel is flanked by navigational buoys and beacons.

The maintenance and operation of the navigation channel can result in several potential effects on processes and functions within Grays Harbor. A review of the wave height time series within Grays Harbor found a steady increase in wave height over time, correlated with the gradual deepening and southward migration of the navigation channel (Osborne 2003 in US Army Corps of Engineers 2014a). Punctuated changes in wave height were not observed following channel deepening in 1976 or early 1990s (Osborne 2003 in US Army Corps of Engineers 2014a). The ongoing deepening and southward migration of the navigation channel have also caused Whitcomb Flats, located 1 mile east of the Westport Marina, to migrate eastward at a rate of 100 feet per year from 1967-2001 (Osborne 2003 in US Army Corps of Engineers 2014a). This migration has resulted in the closure of several oyster growing tracts that were located at and near Whitcomb Flats. The Corps and WDNR considered conducting an additional study of the Whitcomb Flats area through Section 111 of the Water Resource Development Act; however, that study has not been pursued to date (US Army Corps of Engineers 2011).

Figure 5-15. Reaches in the Grays Harbor Estuary AU.

Table 5-31. Reach Functional Analysis Scores in the Grays Harbor Estuary AU.
L=Low, L/M= Low/Moderate, M=Moderate, M/H=Moderate/High, and H=High Functions.

Reach	Hydrologic	Vegetative			Habitat			
	Shoreline Armoring	Forest cover	Total vegetation cover	Marine Vegetation	Priority Habitats and Species	Wetlands	Roads	Fish Passage Barriers
Grays Harbor – 1	H	M/H	H	H	M	H	H	H
Grays Harbor – 2	H	M/H	H	H	M/H	H	H	H
Grays Harbor – 3	M/H	L	H	H	M/H	M/H	H	H
Grays Harbor – 4	M	M	H	H	H	H	H	H
Grays Harbor – 5	M/H	L	H	H	M/H	H	H	H
Grays Harbor – 6	M/H	L	M/H	H	M/H	M	H	H
Grays Harbor – 7	L/M	M	H	H	H	H	H	L/M
Grays Harbor – 8	L	M/H	H	H	M	L	L	L/M
Grays Harbor – 9	M	M/H	H	H	M/H	M/H	M	H
Grays Harbor – 10	M	M/H	H	H	M	M	L	L/M
Grays Harbor – 11	L/M	M/H	H	H	L	L	L	H
Grays Harbor – 12	M	L	L/M	H	M/H	M/H	L/M	H
Grays Harbor – 13	M/H	L/M	H	H	M	H	H	L/M
Grays Harbor – 14	M	M/H	H	H	L	L	L	H
Grays Harbor – 15	M	L	M	H	M	L	L	H
Grays Harbor – 16	H	M/H	H	H	H	L/M	H	H
Grays Harbor – 17	L/M	L	M/H	H	H	H	M	L/M
Grays Harbor – 18	M	L/M	M/H	H	M/H	L	L/M	H
Grays Harbor – 19	H	L	L/M	M	H	H	H	H

Photo 39. Conservation lands along the North Bay (Grays Harbor-2) (Photo from Ecology)

Photo 40. Damon point (Grays Harbor-19) (Photo from Ecology)

Photo 41. Site of dike breach at Redman Slough and tires along Grays Harbor shoreline (Grays Harbor-13) (Photo from Ecology)

Potential Restoration Opportunities

Key restoration and protection strategies that have been identified in the Chehalis Basin Salmon Habitat Restoration and Protection Strategy, Limiting Factors Reports, and recent studies of fish use and potential effects of sea level rise for the Grays Harbor Estuary AU are listed in Table 5-32. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy prioritized restoration actions by waterbody based on the extent to which they address limiting factors for viable salmonid populations (Grays Harbor County Lead Entity 2011). Tier 1 projects address the most pressing limiting factors, whereas Tier 2 and Tier 3 address limiting factors that are not identified as being as immediately pressing in a given waterbody. The 2001 Salmon and Steelhead Limiting Factors Report for WRIA 22 and 23 (Smith and Wenger) also prioritized actions as "high," "medium," or "low" for specific functions (e.g., estuary, floodplain, water quality, fish passage, sediment) by subbasin. Those restoration recommendations from Smith and Wenger (2001) that do not overlap with recommendations from the more recent Chehalis Basin Salmon Habitat Restoration and Preservation Strategy (Grays Harbor County Lead Entity 2011) are included in the tables below.

Table 5-32. Restoration Opportunities in Grays Harbor Estuary AU

Actions	Source	Priority
Actions to address water quality		
• Enhance water quality through sediment dredging/capping, phytoremediation, pier removal • Reduce effluent discharge	Grays Harbor Lead Entity 2011	Tier 1
Actions to address habitat		
• Reclaim developed estuary habitat	Grays Harbor Lead Entity 2011	Tier 1
• Replace tidegate near Bottle Beach State Park (Grays Harbor- 13) to restore tidal inundation to 56 hectares of marsh habitat • Remove tidegate at the slough between the south bay bridge and Westport (Grays Harbor- 17) to restore juvenile salmonid access to 40 hectares of marsh habitat • Restore tidal marsh habitat (up to 150 hectares) at Johns River, where natural dike breach has already restored some function	Sandell et al. 2011	
• Consider water quality evaluation of tire armoring near Bottle Beach State Park (Grays Harbor- 13) • Consider land swaps of low-lying uses with potential detrimental impacts to water quality for public lands on higher grounds	Sandell et al. 2013	
• Protect low-lying lands along the harbor through acquisition or easements to allow space for uplands to transition to tidelands in the case of future sea level rise	Sandell and Mcaninch 2013	

Actions	Source	Priority
• Reduce bank armoring/discourage seawalls • Introduce LWD in lower tidal zone of rivers	Smith and Wenger 2001	High
• Provide fish passage for 6 road crossings on the Campbell slough system (Grays Harbor- 4). Fish passage will be provided with a combination of culverts, bridges, and pullouts on RMAP and orphaned roads.	Habitat Work Schedule 2014	
Actions to address exotic species		
• Invasive species control	Grays Harbor Lead Entity 2011	Tier 2
Actions to improve connectivity		
• Remove migration barriers	Grays Harbor Lead Entity 2011	Tier 2
Actions to address substrate		
• Increase LWD in mud flats • Increase eel grass bed density	Grays Harbor Lead Entity 2011	Tier 3

6 LAND USE ANALYSIS

6.1 Approach

6.1.1 Analysis Scale

Inventory data were used to describe significant land use features. Inventory data were collected at the reach-scale for future use in developing appropriate shoreline designations. For the purposes of understanding broad-scale land use trends, data are summarized by waterbody.

6.1.2 Current Land Use

Existing land use provides a baseline for the types of land use and land use patterns found within shoreline jurisdiction. Existing land use data was obtained from the Grays Harbor County Assessor and then overlaid on the shoreline jurisdiction landward of the ordinary high water mark (OHWM). Uses that occur waterward of the OHWM (e.g., aquaculture) are specifically noted in the discussion of each AU. The County assessor designates a land use code, established in WAC 458-53-030, for each parcel in the County. Each specific land use is assigned a two-digit code. The two digit codes are rolled up into the eight broad categories listed below.

- Residential
- Manufacturing

- Transportation, Communications and Utilities (TCU)
- Trades
- Services
- Cultural, Entertainment and Recreation (CER)
- Resource, Production and Extraction
- Undeveloped Land and Water Areas

Grays Harbor County's economy has historically been heavily focused on resource extraction (forestry, agriculture, and aquaculture). This focus has a strong influence on County's land use pattern and shoreline land use pattern. Because of this, the analysis regrouped some of the land use categories into slightly modified categories in an effort to describe land use, particularly resource extraction land uses in more detail. Trade and service uses were lumped together, but agriculture, forestry, fishing, and mining were pulled out. The resulting land use categories are listed below.

- Agriculture (AG)
- CER
- Fishing/Aquaculture
- Forestry
- Manufacturing/Industrial
- Mining
- Residential
- Trades and Services
- TCU
- Unknown
- Vacant/Undeveloped

Another factor in analyzing current and future land use is that a significant amount of shoreline area that the County Assessor has classified as "undeveloped land" is functionally timber land that is unlikely to change use during the 20-year planning horizon of this SMP update. The assessor classifies lands as vacant or undeveloped when there are no structures or improvement values on the properties. The assessor also excludes designated farmland and forestlands from the vacant/undeveloped category. To better capture lands that are vacant or undeveloped versus lands that are in resource use, Forest Site Class data published by Washington Department of Natural Resource, Forest Practices Division in 2001 was used. Shoreline areas classified as either Forest Site Class I or II or Red Alder (RA) were reclassified from undeveloped to forestry in the land use analysis. To summarize, in order to better represent areas with potential for future development rather than ongoing resource lands, vacant and undeveloped lands reported below represent those lands identified by the County Assessor as "undeveloped land," which do not occur in areas designated as class I or II forestry or Red Alder.

The County Assessor's data may not be updated as frequently as other property information. However, the method described above represents the best readily available information on current land use at a countywide level. The results of the analysis show that the predominant shoreline land use across all of the shoreline jurisdiction analyzed is forestry. Table 6-1 presents the Countywide shoreline land use pattern:

Table 6-1. Countywide Shoreline Land Use Pattern

Land Use	Shoreline Acres	Percent of Shoreline Jurisdiction
Forestry	34,958	55%
Vacant/Undeveloped	9,773	15%
Unknown	9,168	14%
Residential	4,245	7%
Agriculture	3,438	5%
Cultural, Entertainment and Recreation	1,901	3%
Manufacturing/Industrial	410	1%
Transportation, Communications and Utilities	134	<1%
Trades and Services	73	<1%
Fishing	21	<1%
Mining	4	<1%

6.1.3 Shoreline Land Ownership

The QIR, Olympic National Forest (ONF), Olympic National Park (ONP) and Chehalis Indian Reservation comprise substantial portions of Grays Harbor County. The County Assessor does not assess taxes for these areas and, therefore, does not maintain land use information for them. These areas are recoded as "unknown" in the land use analysis. The percentage of each waterbody's shoreline jurisdiction that is within these areas as well as owned by other State, federal or quasi-governmental agencies is reported. The land ownership categories included in the analysis are listed below.

- **Conservancy** – Audubon Society, Forterra, Chehalis River Basin Land Trust
- **Federal** – federal departments, NPS, USFS, USA IN TRUST
- **QIN** – Quinault Indian Nation
- **CIT** – Chehalis Indian Tribe
- **Railroad** –Puget Sound & Pacific Railroad
- **County** – County or County departments, PUDs
- **City** – Various cities
- Port of Grays Harbor

- **State – Others** – State or State departments
- **State – WDFW** – Washington State Department of Fish and Wildlife
- **State – WSDOT** – Washington State Department of Transportation
- **State – State Parks** – Washington State Parks
- **State – DNR** – Washington State Department of Natural Resources
- **Unknown** – no ownership data

It is also important to note that the shoreline ownership dataset is incomplete in some areas. Shoreline jurisdictional areas that exist over non-parcel areas or areas where the OHWM has moved since the parcels were platted do not carry ownership data. The percentage of shoreline jurisdiction with ownership data is listed for each waterbody in the report.

6.1.4 Future Land Use

The State's SMA guidelines (WAC 173-26) require that jurisdictions preparing SMP updates conduct an analysis to estimate the future demand for shoreline space (WAC173-26-201(3)(D)). Because Grays Harbor County does not have the requirement to plan under GMA (RCW 36.70), many of the standard data sources used to estimate future growth, such as buildable lands analyses, are not available. Therefore, this report draws from several alternative sources of information as a means of understanding potential future demand for shoreline space. The zoning of lands that have been classified as vacant and or undeveloped was reviewed to broadly assess the development capacity of each shoreline waterbody. Not all waterbodies have shoreline lands that are classified as vacant. Those that do not are not shown in the analysis figures below. There are a small number of parcels (6-7%) in the County that carry more than one zoning designation. These were excluded from the analysis because it would not be possible to distinguish between the zones.

The County's zoning districts are presented and described for each shoreline waterbody. The County's zoning code includes the zoning districts listed below.

A1 – Agriculture 1	I1 - Industrial	R3 – Residential (Resort)
A2 - Agriculture 2	I2 - Industrial Park	RR – Rural Residential
C2 – Commercial (General)	LQ - Residential (Lake Quinault)	SD – Satsop Development District
G1 – General Development 1	R1 – Residential (Restricted)	SM – Satsop Multi-use District
G5 – General Development 5	R2 – Residential (General)	

Likewise, current shoreline environment designations (SEDs) dictate what types of shoreline development is allowed. The existing SEDs along the County's waterbodies are presented in this analysis.

Past population and employment growth trends in the County suggest the pace of future growth. The Washington State Office of Financial Management (OFM) provides estimates of intercensal population and housing units for each County. In the past 20 years (1990 - 2010), unincorporated Grays Harbor County has experienced a very low annual growth rate in population and housing units. The County's average annual population growth rate from 1990-2010 was 0.7%. The average annual growth for the State in the same time period was 1.9%. The County's growth trend in population and housing units from 1990 to 2010 is shown in Figure 6-1.

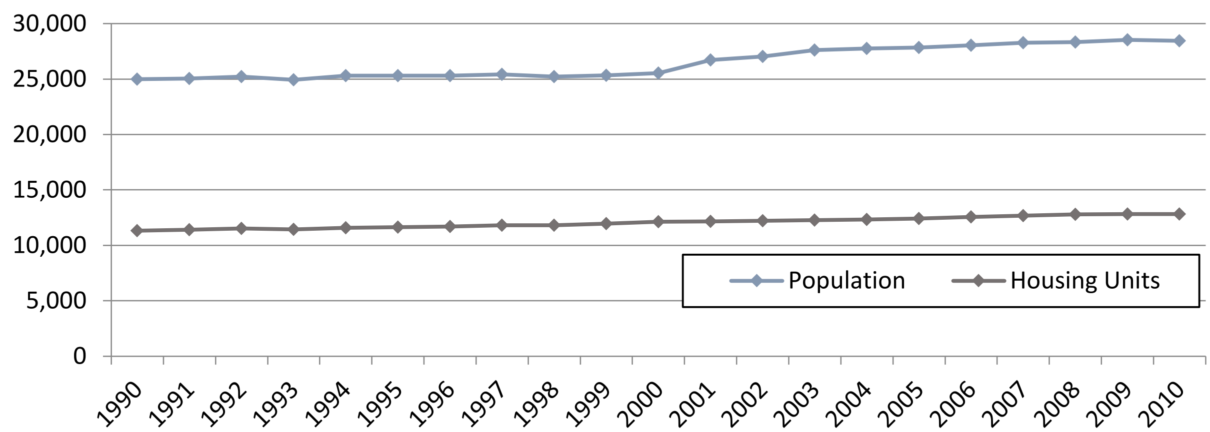


Figure 6-1. Unincorporated Grays Harbor County Population and Housing units 1990-2010 (Source: OFM, 2013; BERK, 2013)

Development tends to occur at nodes where existing, similar development, and services exists or at locations where conditions match the requirements for a specific development type. In addition to identifying current land use patterns and areas of more intense development, current zoning of vacant lands and the location of those vacant lands were analyzed as a means to identify where development capacity exists within the County's shorelines.

6.1.5 Shoreline Use Conflicts

The SMA establishes policy goals implemented through each local jurisdiction's SMP. These goals, which include reserving the shorelines for water-oriented uses, protecting ecological functions, and providing public access, have the potential to conflict with each other. The State's Guidelines require that shoreline use conflicts be identified (WAC 173-26-201) and that approved local SMPs reduce conflicts by including provisions or conditions (WAC 173-26-241) to shoreline use proposals. Some shoreline uses with potential and existing use conflicts in the shorelines of Grays Harbor County are noted below.

Aquacultural uses, which include commercial shellfish harvesting and fishing, are uses that occur in the nearshore and open waters of Grays Harbor and the Pacific Ocean. Aquaculture is reliant on suitable water quality conditions, substrate, and habitat conditions that support the target species. These functions can be affected by upland and adjacent aquatic uses in the watershed. For example, upland land uses that contribute to water quality degradation, including bacterial pollution and nutrient enrichment may limit aquacultural uses. Excess nutrient runoff may result from agricultural practices as a result of fertilizer use or livestock waste. Residential, commercial and other uses can also have detrimental effects on water quality through failing septic systems, chemical applications, and untreated stormwater runoff. These effects to water quality may be mitigated through implementation of best management practices, including proper siting and ongoing maintenance.

Another potential conflict with aquacultural uses may occur from direct changes to the substrate conditions. As described in Section 3.4.4, the Corps maintains the federal navigation channel in Gray Harbor through periodic dredging. The channel serves the port facilities in the County and Cities, which are the only deep water port facilities on Washington's Pacific Coast. The navigation channel has migrated southward, impacting some of the County's oyster tracts, which have been designated as resource lands of long term significance. Dredging operations and dredge disposal also have the potential to cause turbidity or suspend contaminants that may adversely affect juvenile and adult life stages of commercially harvested fish and invertebrates. In addition to maintenance dredging, the Corps plans to deepen the channel by two feet. The Port of Grays Harbor and Weyerhaeuser Twin Harbors Operation also conduct regular dredging of port facilities, marinas, and private terminals around the bay.

Aquacultural uses themselves, which occupy nearshore areas of Grays Harbor, can conflict with other nearshore uses such as public access.

Industrial, aquacultural, and agricultural uses can conflict with adjacent residential and/or commercial uses, usually through issues related to noise, odors and/or hours of operation. The County's zoning helps minimize these potential conflicts.

Forestry and the harvest of timber and other forestry products is also a common use in the upper reaches of the County's rivers. The development and maintenance of forest roads can contribute sediment to downstream waters. Compliance with road development requirements and best maintenance practices, as well as removing unused forest roads can lessen the impacts on watershed processes and functions.

As noted in Section 3.5.4, Grays Harbor has been identified as an area of potential tidal energy exploration. The underwater components of tidal energy production would not conflict with upland uses, but may conflict with commercial fisheries production and the preservation of ecological functions. The upland infrastructure needed for tidal energy installation, such as roads, overwater structures, and staging areas, and the infrastructure needed for operations, such as substations and transmission lines, could represent conflicts with other shoreline uses and public access.

6.1.6 Permit History

The County's shoreline permit history was reviewed using Ecology's permit database. All shoreline permits including shoreline substantial development permits (SDP), shoreline conditional use permits (CUP) and shoreline variances issued since 1972 were included. The State has used several databases over the years, so that not all of the same data is available for all shoreline permits. Some of the older records do not include permit type and several of the permit records do not include the permitted projects locations. However, the review of permit history does provide an idea of development activity in the County's shorelines since adoption of SMA in 1972. Overall, there were approximately 825 shoreline permits recorded since 1972 in the County. Of those 217 are of an unknown type and 26 do not indicate where the permitted project was located. Figure 6-2 presents the numbers of shoreline permit types since 1972.

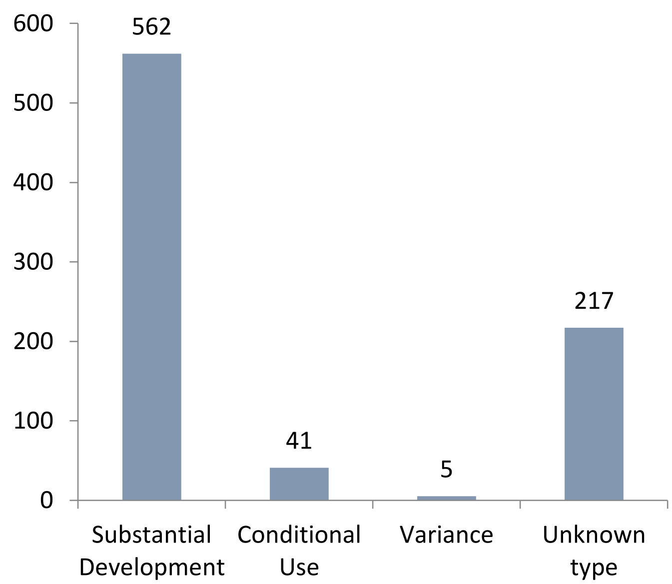


Figure 6-2. Grays Harbor County Shoreline Permits 1971-2013
(Source: Ecology, 2013; BERK, 2013)

It is also important to note that the pace of shoreline permit applications has slowed dramatically in recent years. Since 2000, there have only been 122 (15% of the total) shoreline permit applications. Some of this decrease may be attributable to fewer shoreline activities.

However, the decrease is also attributable to the increase in the number of exemptions that have been added since the SMA was adopted. Figure 6-3 shows the shoreline permit trend over time.

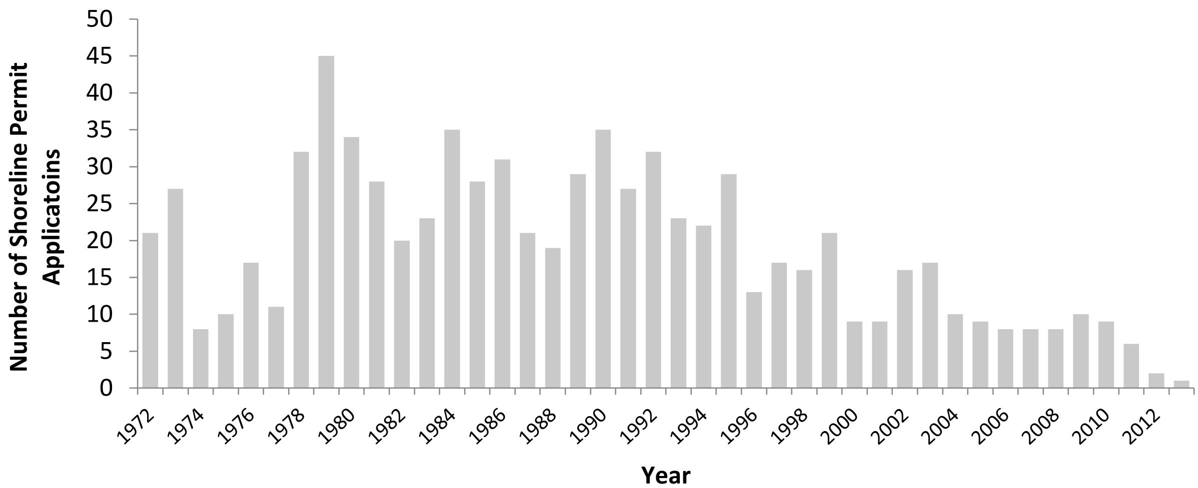


Figure 6-3. Shoreline Permit Applications 1972 – 2013
(Source: Ecology, 2013; BERK, 2013)

6.1.7 Transportation and Utilities

As noted in Chapter 4, transportation and utility infrastructure is often placed parallel, crossing or in close proximity to shorelines. All known transportation infrastructure including roads, bridges and railways located in shoreline jurisdiction were identified and are described for each Assessment Unit. There are several airports in the County's shoreline jurisdiction as well. However, they are within the incorporated Cities of Hoquiam, Westport, and Ocean Shores. The Puget Sound & Pacific Railroad (PSAP) transports freight over 108 miles of track in Northwest Washington. The rail principally connects the harbor facilities near Aberdeen and Hoquiam to rail connection to the west. Rail lines in the County's shorelines are described for waterbodies in each AU.

Spatial data on utility infrastructure is far more limited. Data on the locations of electrical substations and transmission lines was available. Most of the electrical utility infrastructure in the County is located near the population centers of Aberdeen, Hoquiam and other cities along the Chehalis River. There are approximately 40 electrical substations in the County. The majority of these are located within the County's cities and most are not located in shoreline jurisdiction. The substations located in or near shoreline jurisdiction are noted below.

- Moclips River – Near Shoreline jurisdiction
- Stevens Creek – North of confluence with Humptulips River
- Hoquiam River – Immediately North of Hoquiam

- Hoquiam River, EF – Approximately 8.5 miles north of Hoquiam
- Pacific Ocean – two are located south of Westport, but outside of shoreline jurisdiction

A Bonneville Power Administration (BPA) transmission line runs though the County. It primarily travels through the Chehalis River corridor. The line is within or crosses shoreline jurisdiction at the following points from east to west.

- Mox Chehalis Creek – Crosses at its confluence with Sand Creek
- Chehalis River – Crosses the river north of Delezene Creek
- Workman Creek – Crosses the Creek southwest of Elma
- Chehalis River – Parallels the River between Elma and Montesano and then crosses the River south of Montesano.
- Wishkah River – Crosses the River immediately north of Aberdeen
- Little North River – A spur parallels the Little North River to its confluence with North River
- Lower Salmon Creek – Crossing immediately north of the County boundary

Most of the mapped local transmission lines are co-located with the BPA line. There is a mapped local line that parallels and runs in the Elliot Slough shoreline jurisdiction.

A natural gas pipeline extends from Vail, Washington, to the Satsop Development Park. The precise locations of the pipelines are not released due to security concerns, but the pipeline likely runs within and/or crosses one or more shoreline waterbodies in or near Satsop, Elma, and east toward Vail.

6.2 Results

6.2.1 Queets

The Queets AU contains three jurisdictional rivers and streams analyzed as three shoreline reaches. Table 6-2 provides details on each waterbody's characteristics.

Table 6-2. Summary Characteristics of Queets AU Waterbodies
(Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Harlow Creek	4	2	• QIN 100% (100%)
Queets River	79	5	• QIN 51%

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
			• Private 7% (58%)
Salmon River	473	18	• QIN ....72% • Private ....1% • Federal 1% (74%)

Current and Future Land Use

The Queets AU is located at the northern boundary of the County within the QIR County Assessors land use data is not available for tribal lands. Visual review of aerial imagery indicates that the AU's shoreline are primarily in forestry use or undeveloped. Current County land use data show that approximately 11 percent of the AU's shoreline lands are vacant or undeveloped (60 acres). The same data show that 23 acres are classified as forestry. This likely understates the forestry use because approximately 85% of the AU's shoreline lands do not have classified land use.

The County's Comprehensive Land Use map, zoning districts and shoreline environment designations are not applied within the QIR Comprehensive Plan and zoning designations within the QIR were not available at the time of this analysis work.

Water-Oriented Uses

The Quinault National Fish Hatchery on the Salmon River is the only identified water-oriented use in the AU.

Shoreline Permit History

Only one shoreline permit has been issued since 1972 – a substantial development permit issued in 1973. The project description is not contained in the State permit tracking database.

Transportation and Utilities

There is little road or transportation infrastructure within the shoreline jurisdiction of the Queets AU. SR 101 crosses the Queets River just north of the Grays Harbor County border. There are minor roads and logging roads with shoreline jurisdiction.

Public Access

The Olympic National Forest provides access within the AU. Non-tribal members are required to be accompanied by a tribal member guide to fish on rivers within the QIR.

Identified conservation easements and protected lands include Queets Estuary (Forterra).

Historic and Archeological Sites

There are no historic sites listed in the DAHP Inventory of State or National Register of Historic Places in or near shoreline jurisdiction. However, based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.2 Quinault

Summary

The Quinault AU contains 24 jurisdictional rivers, streams and lakes including Lake Quinault. Table 6-3 provides details on each waterbody's characteristics.

Table 6-3. Summary Characteristics of Quinault AU Waterbodies
(Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Boulder Creek 1	353	15	• Federal ... 5% • Private ... 9% • QIN ... 86% (100%)
Boulder Creek 2	124	19	• ONF ... 30% • Private ... 13% • QIN ... 57% (100%)
Camp Creek	233	16	• Private ... 9% • QIN ... 90% (100%)
Cannings Creek	34	1	• ONP ... 100% (100%)
Cook Creek	935	72	• Federal ... 2% • ONF ... 24% • Private ... 36% • QIN ... 38% (100%)
Duck Creek	94	5	• QIN ... 96% (96%)
Falls Creek 1	87	2	• ONF ... 98% (98%)
Fletcher Canyon	75	2	• ONF ... 100% (100%)
Howe Creek	74	3	• ONF ... 91% • ONP ... 9% (100%)
Lake Quinault	262	247	• Federal ... 10% • ONF ... 7% • ONP ... 13% • Private ... 27% • QIN ... 16% (73%)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Mounts Creek	287	17	• Federal .... 1% • Private .... 9% • QIN 89% (100%)
Prairie Creek	335	53	• ONF........ 7% • ONP .... 1% • Private .... 10% • QIN 82% (100%)
Quinault River	2,745	268	• Federal .... 1% • Private .... 6% • QIN 72% (78%)
Raft River	619	43	• Federal .... <1% • Private .... 57% • QIN .... 32% • Unknown 1% (90%)
Raft River, NF	685	29	• Federal .... 2% • Private .... 27% • QIN 71% (71%)
Raft River, Tribs	569	33	• Federal .... 2% • Private .... 30% • QIN 69% (100%)
Red Creek	167	10	• Private .... 76% • QIN 24% (100%)
Ten O'clock Creek	384	17	• Private .... 7% • QIN 93% (100%)
Upper Quinault River	1,579	174	• Federal .... 41% • ONF........ 17% • ONP .... 3% • Private .... 21% • State 1%

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
			(84%)
Whale Creek	127	6	• Private .... 14% • QIN 84% (98%)
Whale Creek, NF	77	7	• Federal .... 9% • Private .... <1% • QIN 88% (88%)
Willaby Creek	148	8	• ONF .... 99% • Private .... <1% (99%)
Wolf Creek	99	4	• QIN 100% (100%)
Ziegler Creek	203	53	• ONF .... 47% • Private .... 50% • State .... <1% (97%)

Current and Future Land Use

Current Land Use

The Quinault River AU runs through the QIR, Olympic National Park, Colonel Bob Wilderness, and Olympic National Forest. Land use within the QIR has not been classified by the County Assessor. However, lands that are owned by non-tribal members within the reservation are classified. Of the 10,297 acres of shoreline uplands within the AU, 4,036 acres (39%) are classified as unknown. These are shorelines likely in the QIR. Of the remaining shoreline area, approximately 30% are classified as forestry and 18% are classified as vacant or undeveloped. No other land use exceeds 3%. There are 256 acres (2.6%) of residential land use and 33 acres (<1%) of recreational land use. The residential and recreational uses are located in the Lake Quinault area.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The County's Comprehensive Land Use Map only designated lands surrounding Lake Quinault. The western and northern shore to the west side of the Quinault River are designated Recreational – Residential. The eastern and northern shores of Lake Quinault to the western shore of the Quinault River are designated Lake Quinault. The western shores of Lake Quinault are not zoned by the County. The eastern shoreline is zoned LQ. There is an additional area zoned LQ west of the Lake along SR 101. The purpose of the LQ zone is to “support residential and economic diversity and growth in the communities of Lake Quinault and Neilton as provided in the Lake Quinault sub-area comprehensive land use development plan” (GHC 17.42.010).

Potential Future Land Use
Most of this AU is within the QIR Data for the reservation is not available to suggest a level of demand for shoreline development. Zoning and comprehensive plan data is available for areas outside of the QIR and National Forest. There are approximately 94 acres of vacant or undeveloped shoreline lands along the Upper Quinault River. Development related to recreational opportunities at the lake is possible in this location. Although, given the low density zoning and current low density land use patterns, the intensity of future shoreline development would not be anticipated to be high.

Water-Oriented Uses
Identified water-oriented uses in this AU include recreational uses around Lake Quinault including three boat launches. Water-related and enjoyment uses include recreational uses as well as the parks and public access sites listed below. Water-dependent uses would also include utility outfalls and intakes.

Shoreline Permit History

Within the Lake Quinault AU, only one shoreline permits has been issued since 1972. The permit was a substantial development permit issued in 1996 for a golf course along Zeigler creek.

Transportation

Generally, there is very little road and transportation infrastructure development in the Quinault AU shoreline jurisdiction. Road development is concentrated around the Lake Quinault region, Upper Quinault reaches, and the mouth of the river where it joins the Pacific Ocean (Quinault River – 1). There are approximately 15 bridges within shoreline jurisdiction. Major and minor roads are listed below.

Major Roads:

- US 101 crosses the Quinault River near the southern end of Lake Quinault (Quinault River – 4, 5). It also crosses Prairie Creek (Prairie Creek – 2).
- SR 109 crosses the Quinault River near the mouth of the river (Quinault River – 1).

Minor Roads:

- Upstream, a few stretches along minor roads are within shoreline jurisdiction in the Upper Quinault River (Upper Quinault – 3), Ziegler Creek (Ziegler Creek – 1) and Lake Quinault (Lake Quinault – 1, 5, 8). Cook Creek Road (Moclips Highway) crosses Cook Creek in four locations (Cook Creek – 2, 3).
- Downstream, a few minor roads are within shoreline jurisdiction at the mouth of the Quinault River (Quinault River – 1).

Public Access

Public Access in the Quinault AU includes 934 acres of shoreline uplands within the Olympic National Forest and National Park. It also includes the recreational opportunities around Lake Quinault including two campgrounds and three boat launches. Non-tribal members are required to be accompanied by a tribal member guide to fish on rivers within the QIR.

Historic and Archeological Sites

There are 17 historic sites in the DAHP Inventory of State or National Register of Historic Places in or near shoreline jurisdiction. Not all sites have been identified. Those identified are listed below.

- Olson Recreation Residence
- Linder Recreation Residence
- Olson Recreation Residence.
- Hobi, J.F., House
- Kinne, J.B. Recreation Residence
- Osborn, M.D. Recreation Residence
- Endresen, L.C. Recreation Residence
- Kestner, Otto Recreation Residence
- Osborn, H.R. Recreation Residence
- Carlson, E.G. Recreation Residence
- Brudevold, Peter and Sophia Recreation Residence
- Johnson, Elam Recreation Residence
- Dr. W.M. Parpala Recreation Residence
- Hollinger, W.H. Recreation Residence
- Carlyle, Norman Recreation Residence
- Halkowicz Recreation Residence

Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.3 Moclips/Copalis

Summary

The Moclips/Copalis AU contains eight jurisdictional rivers and streams. Table 6-4 provides details on each waterbody's characteristics.

Table 6-4. Summary Characteristics of Moclips/Copalis AU Waterbodies
(Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Boone Creek	177	23	• Private 97% (97%)
Connor Creek	368	206	• County ....27% • Private ....66% • QIN ....1% • Unknown..........2% (96%)
Copalis River	1,349	120	• County ....20% • Private ....58% • State – DNR ....1% • State – Others ....10% • State - State Parks ....5% • State – WSDOT..........1% (94%)
Cranberry Creek	96	6	• County ....73% • Private 27% (100%)
Joe Creek 2	386	40	• County ....<1% • Private ....92% • State – Others 7% (99%)
Moclips River	442	142	• Conservancy..........7% • County ....<1% • Federal ....<1% • Private ....24% • QIN ....57% • State – DNR ....4% • State - State Parks ....1% • State – WSDOT..........1% (93%)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Moclips River, NF	517	52	• Federal .... 5% • Private .... 30% • QIN 64% (98%)
Wreck Creek	26	3	• QIN 100% (100%)

Current Land Use

The Moclips/Copalis River AU is dominated by lands classified as forestry (RCW 84.33), which comprises more than half (59%) of the shoreline jurisdiction. Vacant and undeveloped lands comprise 30% of the shoreline jurisdiction. Shoreline residential, recreational, and commercial development (5.3%) is clustered at the downstream reaches near Moclips, Copalis Beach, and Pacific Beach.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The County's Comprehensive Land Use Map designates the majority of the AU's shoreline jurisdiction General Development with areas along the coast designated as Recreational Residential. County zoning generally implements the Comprehensive Land Use Map. In the middle and upper reaches, zoning is primarily G5. In the lower reaches, near the Pacific Coast, zoning is Primarily R3, which allows and encourages recreational as well as standard residential development at relatively high densities (1du/7,200 square feet). A small area near Copalis Beach is zoned C2. There is no County zoning in the QIN. Current shoreline designations include Conservancy, Rural and Urban. Table 6-5 provides a summary of current land use, zoning and current SEDs.

Table 6-5. Moclips/Copalis River Land Use, Zoning and Current Shoreline Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Boone Creek	• Forestry .... 94% • Residential .... 2% • Vacant/Undeveloped ..... 2% • TCU .... <1%	• General Dev 5........... 72% • Residential I (Resort) 28%	• Rural
Connor Creek	• Forestry 46%	• Residential I (Resort) 68% • General Dev 5........... 31%	• Rural

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
	• Vacant/Undeveloped ... 34% • CER.............................. 8% • Residential .... 5% • Unknown .... 2% • TCU.............................. 1% • Trades and Services.... <1%	• Commercial I............ <1%	
Copalis River	• Forestry....................... 54% • Vacant/Undeveloped.... 31% • Residential .... 6% • CER.............................. 3% • TCU............................ <1% • Trades and Services.... <1%	• General Dev 5.......... 77% • Residential I (Resort) 23%	• Conservancy • Rural • Urban
Cranberry Creek	• Vacant/Undeveloped.... 62% • Forestry....................... 38%	• General Dev 5.......... 76% • Residential I (Resort) 24%	• Not designated
Joe Creek 2	• Forestry....................... 88% • Vacant/Undeveloped.... 11% • TCU............................ <1%	• General Dev 5.......... 97% • Residential I (Resort). 3%	• Conservancy • Urban
Moclips River	• Unknown .... 45% • Vacant/Undeveloped.... 25% • Forestry....................... 22% • Residential .... 2% • Trades and Services.... <1% • CER............................ <1% • Manufacturing/Industrial <1% • TCU............................ <1%	• Not Zoned .... 63% • General Dev 5........... 22% • Residential I (Resort) 15%	• Conservancy • Urban
Moclips River, NF	• Vacant/Undeveloped.... 46% • Forestry....................... 33% • Unknown 19%	• Not Zoned 100%	• Not designated
Wreck Creek	• Unknown .... 86% • Vacant/Undeveloped.... 14%	• Not Zoned 100%	• Not designated

Potential Future Land Use

Within the Moclips/Copalis AU, there are approximately 1,843 vacant or undeveloped acres of shoreline, representing 18% of the AUs total shoreline jurisdiction. Figure 6-4 presents the area (acres) and current zoning of those lands for each waterbody in the AU. As shown, most of the zoned vacant and undeveloped lands in the AU are within the Copalis River and Conner Creek shorelines. The majority of those areas are zoned for general development (G5), residential development. This area could allow for a much higher level of residential and commercial development than exists currently.

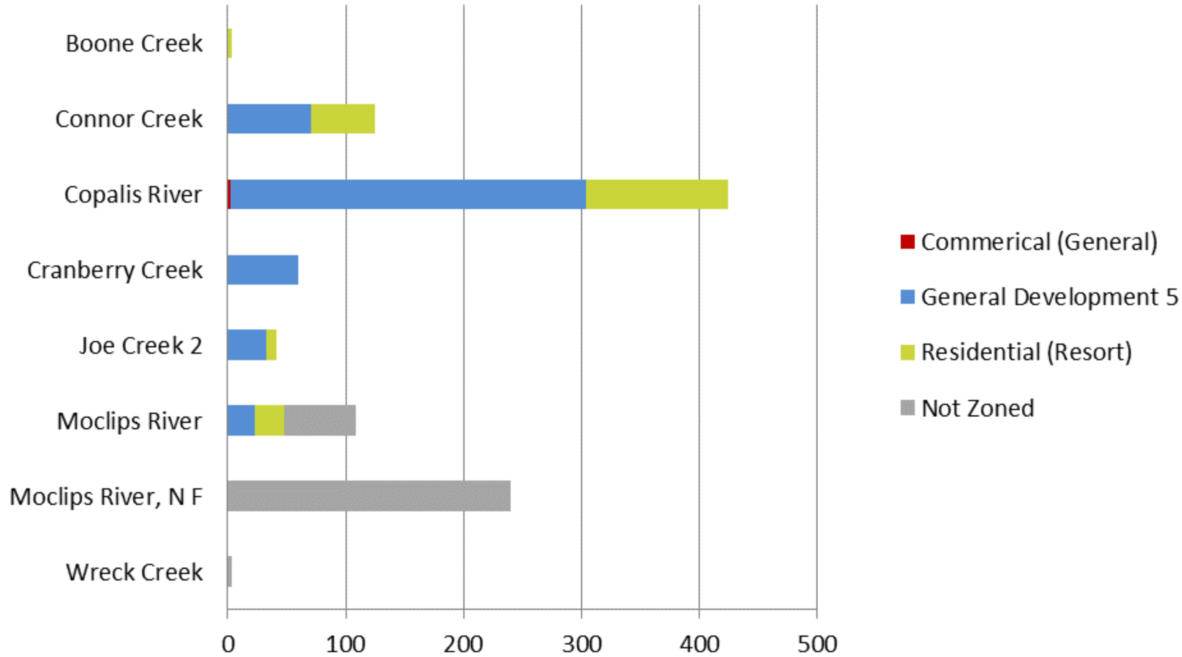


Figure 6-4. Moclips/Copalis AU Zoning of Vacant and Undeveloped Shoreline Uplands (acres) (Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Water-Oriented Uses

Water-oriented uses in the AU include restaurants and other water enjoyment uses in the downstream reaches of the AU's waterbodies. These uses are clustered within the communities of Moclips, Copalis Beach and Pacific Beach. Public access sites and recreational development are also considered water-oriented. Utility outfalls are also considered water-oriented.

Shoreline Permit History

Within the Moclips/Copalis AU, 23 shoreline permits have been issued since 1972. Of those, 19 were substantial development permits (SDP), two were conditional use (CUP), one was a variance and one was untyped. Since 2000, only eight shoreline permits have been issued.

Transportation

Generally, there is little road or transportation infrastructure development within the shoreline jurisdiction of the Moclips/Copalis AU. Roads in shoreline areas are concentrated in downstream areas of the Moclips River, Copalis River, Joe Creek, and Connor Creek near the Pacific Coast. There are approximately 8 bridges within shoreline jurisdiction. Major and minor roads are listed below.

Major Roads:

- SR 109 crosses several waterbodies near the Pacific Coast, including the Moclips River (Moclips River – 1), Joe Creek (Joe Creek – 1), Boone Creek (Reach 1), Copalis River (Copalis River – 1), and Connor Creek (Connor Creek – 1).

Minor Roads:

- Minor roads, typically residential access roads, are within shoreline jurisdiction where major water bodies meet the Pacific Ocean.
- Cook Creek Road (Moclips Highway) crosses the Moclips River at the split between the Moclips River and the North Fork (Moclips River, NF – 1).
- Ocean Beach Road crosses Joe Creek downstream near the Pacific Coast (Joe Creek – 1). It also crosses the Copalis River in the midstream section of the river (Copalis River – 2).

Public Access

Identified public access sites are listed below.

- Dr. Edward Lycan Park
- Griffith-Priday State Park
- Iron Springs in Copalis Beach
- Moclips, Sunset Beach

Identified conservation easements and protected lands are listed below.

- Copalis River (Forterra)
- Hogan's Corner (Forterra)

Historic and Archeological Sites

There is one historic site listed in the DAHP Inventory of State or National Register of Historic Places in or near shoreline jurisdiction. It is identified as the Dorothy Anderson Cabin. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.4 Humptulips

Summary

The Humptulips AU contains 13 jurisdictional rivers and streams and one lake. They have been divided into 26 shoreline analysis reaches. Table 6-6 provides further details on each waterbody's characteristics.

Table 6-6. Summary Characteristics of Humptulips AU Waterbodies
(Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Big Creek 2	554	47	• Private ....95% • State – Others 3% (98%)
Brittain Creek	179	8	• Private 100% (100%)
Chenois Creek	313	48	• Conservancy..............1% • County ....2% • Federal ....3% • Private 92% (98%)
Chester Creek	281	9	• ONF 100% (100%)
Damon Creek	24	6	• Private 100% (100%)
Deep Creek	266	21	• Conservancy.............12% • County ....9% • Private ....75% • State – WDFW.............3% (100%)
Donkey Creek	183	17	• Federal ....10% • ONF ....9% • Private ....76% • State – Others 5% (100%)
Failor Lake	62	9	• Private ....8% • State – WDFW...........92% (100%)
Fairchild Creek	51	6	• Private 100% (100%)
Hansen Creek	85	24	• Private 99% (99%)
Humptulips River	2138	329	• Conservancy.............10% • County 4%

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
			• Private ....69% • State – Others ....1% • State – WDFW................3% • State – WSDOT............<1% (87%)
Humptulips River, EF	1587	58	• County ....7% • ONF ....55% • Private 36% (98%)
Humptulips River, WF	1989	71	• County ....<1% • Federal ....7% • ONF ....58% • Private ....29% • State – Others 5% (100%)
Stevens Creek	713	30	• Conservancy...................3% • County ....5% • ONF ....1% • Private ....87% • State – WDFW.............<1% (96%)

Current and Future Land Use

Current Land Use

Current shoreline land use in the Humptulips River AU is dominated by forestry, which account for approximately 59% of the shoreline jurisdiction. Residential and agricultural land uses occur at the downstream sections of the Humptulips River and tributaries as these waterbodies flow south and southwest toward Grays Harbor. Generally, residential use is concentrated around the rivers and waterbodies near the communities of Humptulips, Axford, Newton, Tulips and Burrows. The small amount of commercial and manufacturing land use occurs along Hansen Creek near the community of Axford.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The County's Comprehensive Land Use Map designates the majority of the AU's shoreline uplands as Agriculture and General Development. The area around Humptulips is designated as Urbanizing. County zoning is not consistent with these designations in all areas. Zoning in the lower and middle reaches of the AU is dominated by G5, with a small amount of A1 along

Grays Harbor south of SR 109. Zoning in the upper reaches also includes the County's LQ zone within the Olympic National Forest. Table 6-7 provides a summary of current land use, zoning and current SEDs.

Table 6-7. Humptulips Land Use, Zoning and Current Shoreline Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Big Creek 2	• Forestry .... 89% • Residential .... 5% • Vacant/Undeveloped...... 4%	• General Dev 5 ....100%	• Conservancy
Brittain Creek	• Forestry .... 99% • Residential .... <1%	• General Dev 5 .... 100%	• Not designated
Chenois Creek	• Forestry .... 81% • Vacant/Undeveloped.... 12% • Residential .... 5% • Fishing.......................... <1%	• General Dev 5 .... 100%	• Not designated
Chester Creek	• Unknown 100%	• Residential (Lake Quinault) 100%	• Not designated
Damon Creek	• Forestry .... 64% • CER.............................. 23% • Residential .... 12% • Vacant/Undeveloped.... <1%	• General Dev 5 ....100%	• Not designated
Deep Creek	• Forestry .... 87% • Vacant/Undeveloped.... 13%	• General Dev 5 .... 100%	• Conservancy
Donkey Creek	• Forestry .... 83% • Unknown .... 9% • Vacant/Undeveloped...... 7%	• General Dev 5 .... 79% • Not Zoned.................... 21%	• Conservancy
Failor Lake	• Vacant/Undeveloped.... 60% • Forestry 40%	• General Dev 5 .... 100%	• Conservancy
Fairchild Creek	• Forestry 100%	• General Dev 5 .... 100%	• Not designated
Hansen Creek	• Forestry .... 60% • Residential .... 38% • Vacant/Undeveloped...... 1%	• General Dev 5 .... 100%	• Not designated
Humptulips River	• Forestry .... 66% • Vacant/Undeveloped.... 11% • Residential .... 8% • Fishing............................ 1%	• General Dev 5 .... 99.65% • Commercial I .... <1%%	• Conservancy • Rural

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
	• CER.................................1% • Agriculture ....<1% • Mining...........................<1% • Manufacturing/Industrial...... <1% • Trades and Services ....<1%		
Humptulips River, EF	• Unknown ....55% • Forestry.........................43%	• General Dev 5 .... 45% • Not Zoned.................... 55%	• Conservancy
Humptulips River, WF	• Unknown ....58% • Forestry.........................39% • Vacant/Undeveloped...... 2%	• General Dev 5 .... 36% • Not Zoned.................... 34% • Residential (Lake Quinault) 30%	• Conservancy
Stevens Creek	• Forestry.........................91% • Vacant/Undeveloped...... 4% • Unknown ....1% • Residential ....<1% • Fishing..........................<1%	• General Dev 5 .... 99% • Not Zoned.......................1%	• Conservancy

Potential Future Land Use

The County's shorelines have very limited vacant or undeveloped lands that provide capacity for new development. There are 454 acres of lands classified as vacant or undeveloped, representing 5.4% of shoreline jurisdiction. Most of the vacant land is zoned for low density development (G5). Approximately 94% of those vacant lands are zoned Q5. The acreage and current zoning of those lands are shown for each waterbody in Figure 6-5. As shown, most of the vacant and undeveloped land in the AU is within the Humptulips River shoreline. Zoning along this water body is predominantly G5. Uses allowed in that district include low density residential development and agricultural uses.

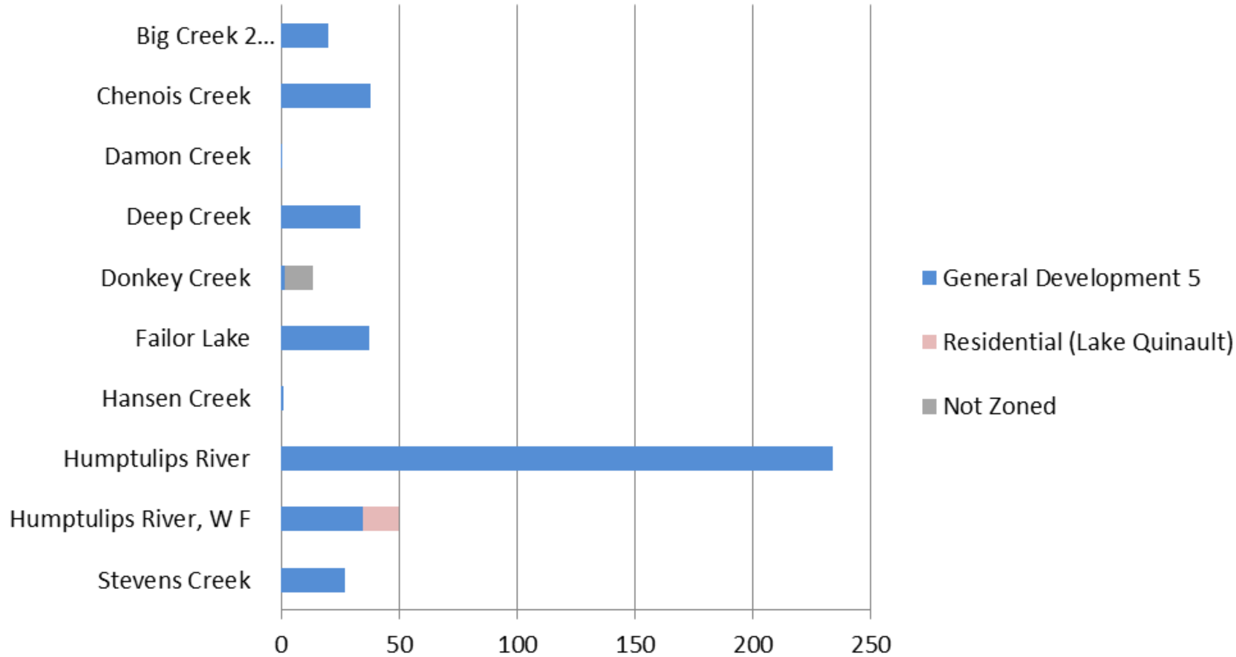


Figure 6-5. Humptulips AU Zoning of Vacant and Undeveloped Shoreline Uplands (acres) (Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Water-Oriented Uses

Identified water-oriented uses in this AU include the Humptulips Salmon Hatchery located just south of the town of Humptulips, at the mouth of Stevens Creek. Water-dependent uses would also include utility outfalls and intakes. Water-related and enjoyment uses include recreational uses as well as the parks and public access sites noted below.

Shoreline Permit History

Within the Humptulips AU, 87 shoreline permits have been issued since 1972. Approximately 58 were SDP and 29 are of an unknown type. Since 2000, only seven shoreline permits have been issued. The most commonly permitted activity has been gravel removal from the Humptulips River.

Transportation

Generally, the Humptulips AU has little road and transportation infrastructure development within shoreline jurisdiction. Roads within shoreline jurisdiction are concentrated in several sections- along Donkey Creek (Donkey Creek – 1), Humptulips River at the town of Humptulips (Humptulips River – 9) and downstream reaches of the river (Humptulips River – 1, 2, 3). There are approximately 12 bridges within shoreline jurisdiction. Major and minor roads are listed below.

Major Roads:

- SR 109 crosses the Humptulips River near the mouth of the river at Grays Harbor (Humptulips River– 1). It crosses Chenois Creek near the mouth of the creek where it meets Grays Harbor (Chenois Creek – 1).
- US 101 crosses the Humptulips River just south of the split between the West and East Forks near the town of Humptulips (Humptulips River – 9). It also crosses the lower reach of Stevens Creek (Stevens Creek – 1).
- There are approximately 4 bridges on major roads within shoreline jurisdiction.

Minor Roads:

- Minor roads within shoreline jurisdiction are concentrated within river valleys downstream from Shye Lake to the mouth of the river, as well as in shoreline jurisdiction near the town of Humptulips (Humptulips River – 1, 2, 3).
- Donkey Creek Road is within shoreline jurisdiction in the lower reaches of Donkey Creek (Donkey Creek – 1, 2), the upper reaches of the East Fork of the Humptulips River (Humptulips River, EF – 2), and the lower reaches of the West Fork of the Humptulips River (Humptulips River, WF – 1).
- There are approximately 8 bridges on minor roads within shoreline jurisdiction.

Public Access

Identified public access sites are listed below.

- Shorelines in the Olympic National Forest.
- There are five public boat launches on the Humptulips River, one on Deep Creek, and one on Failor Lake.
- WDFW Humptulips –Grass Creek Unit is located in North Bay at the confluence of the Humptulips River, Grass Creek and Grays Harbor. It provides opportunities for fishing and bird watching.

Historic and Archeological Sites

There is one historic sites listed in the DAHP inventory of State or National Register of Historic Places in or near shoreline jurisdiction just north of Hoquiam. It is not identified by name. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.5 Hoquiam

Summary

The Hoquiam AU contains three jurisdictional rivers that have been divided into 11 shoreline analysis reaches. Table 6-8 provides further details on each waterbody's characteristics.

Table 6-8. Summary Characteristics of Humptulips AU Waterbodies
(Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Hoquiam River, EF	1,585	310	• Conservancy.................24% • County ....2% • Private ....69% • State – Others ....<1% (94%)
Hoquiam River, MF	358	21	• Conservancy...................7% • County ....8% • Private ....70% • State – Others 14% (98%)
Hoquiam River, WF (Reaches 1 and 2)	417	46	• Conservancy.................70% • Port of Grays Harbor ......9% • Private 13% (92%)
Hoquiam River, WF (Reaches 3-5)	585	122	• City ....41% • Conservancy.................17% • County ....<1% • Private ....29% • State – Others ....<1% (87%)

Current and Future Land Use

Current Land Use

According to the County Assessor, current shoreline land use in the lower reaches of the Hoquiam River West Fork is predominantly in forestry and recreational uses. Forestry accounts for approximately 45% of shoreline land use. Recreational uses comprise 27% of the shoreline lands. A substantial amount of shoreline area in the lower reaches of all three forks of the Hoquiam River is owned by Forterra (previously the Cascade Land Conservancy). These lands are referred to as the Hoquiam River Surge Plain. The area is located north of the City of

Hoquiam and is composed of large areas of contiguous riparian wetland habitat. The area includes approximately ten miles of shoreline. These lands are being managed for flood abatement, water quality, and salmon and wildlife habitat.

Shoreline residential use is concentrated along the middle and lower reaches of the rivers and most densely concentrated near the communities of Hoquiam, Woodlawn, New London and Nisson. Agricultural and low density residential uses occur at the downstream sections of the waterbodies as the river approaches the City of Hoquiam.

Along the shoreline areas of the upper reaches of the Hoquiam River West Fork, agricultural use is concentrated north of New London. The shoreline areas of the Hoquiam River Middle Fork are predominately used in forestry with some agricultural use upstream and more concentrated agricultural use downstream where the river joins the West Fork. Along the Hoquiam River East Fork, residential land use occurs north of Nisson and stretches south as the East Fork joins the Main Fork near the City of Hoquiam.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The County's Comprehensive Land Use Map designates the upper reaches of this AU General Development. The lower reaches north of the City of Hoquiam are designated as Urbanizing. The Urbanizing designation is not reflected in the County's current zoning. Rather, zoning is consistent with current land use.

Nearly all of the shoreline area is zoned as G5, which allows rural residential development and agriculture. A small area along the lower reaches of the Hoquiam River West Fork is zoned I2, where a logging operation is currently located. A small area along the East Fork Hoquiam River west of E Hoquiam Road is zoned I1. The area is undeveloped. This is the only I1 zoning in the County. Table 6-9 provides a summary of current land use, zoning and current SEDs.

Table 6-9. Hoquiam Land Use, Zoning and Current Shoreline Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Hoquiam River, EF	• Forestry.....................46% • CER ....24% • Residential ....15% • Vacant/Undeveloped ..7% • Agriculture...................1% • TCU ....<1% • Trades and Services.<1%	• General Dev 5........99% • Industrial 1%	• Conservancy • Rural • Urban

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Hoquiam River, MF	• Forestry....................84% • CER ....7% • Vacant/Undeveloped ..7% • Residential................<1%	• General Dev 5..... 100%	• Conservancy • Rural
Hoquiam River, WF (Reaches 1-2)	• CER ....70% • Vacant/Undeveloped 11% • Forestry......................9% • Manufacturing/Industrial 2 % • Trades and Services.<1% • Residential................<1% • TCU ....<1%	• General Dev 5....... 95% • Industrial – 4%	• Rural • Urban
Hoquiam River, WF (Reaches 3-5)	• Forestry....................45% • CER ....14% • Vacant/Undeveloped 14% • Residential................11% • TCU ....3% • Trades and Services.<1%	• General Dev 5........99%	• Conservancy • Rural

Potential Future Land Use

This AU's shorelines have limited lands that provide capacity for new development. There are approximately 230 acres classified as vacant or undeveloped. All of these lands are zoned G5. Uses allowed in that district include low density residential development and agricultural uses. The relatively small amount of vacant land and low density zoning will likely result in a low level of future shoreline development. The acreage and current zoning of those lands are shown for each waterbody in Figure 6-6.

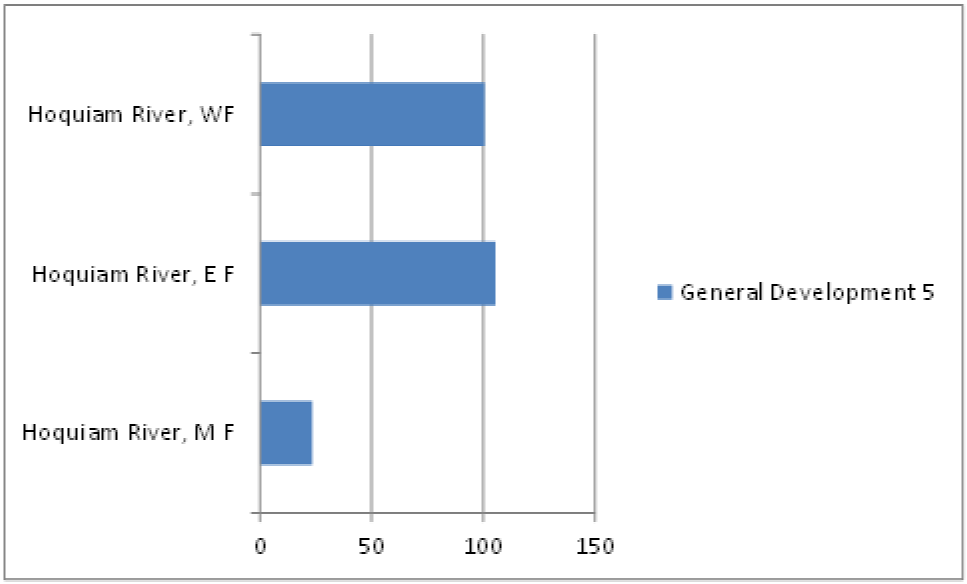


Figure 6-6. Hoquiam AU Zoning of Vacant and Undeveloped Shoreline Uplands (acres) (Source: Grays Harbor County, 2013; TWC, 2103, BERK, 2013)

Water-Oriented Uses

There are no identified water-oriented uses within the Hoquiam AU. There are industrial uses along the rivers, but it is unclear as to their dependence on a shoreline location. Water-dependent uses would also include utility outfalls and intakes. Water-related and enjoyment uses include recreational uses as well as the parks and public access sites listed below.

Shoreline Permit History

Within the Hoquiam AU, 34 shoreline permits have been issued since 1972. Approximately 28 were SDP and one was a variance. Five permits are of an unknown type. Only three permits have been issued since 2000. The most recent permit was an SDP to replace an existing water pipeline within and adjacent to SR 101 north of the City of Hoquiam.

Transportation

Generally, roads and transportation infrastructure within shoreline jurisdiction of the Hoquiam AU are concentrated along the Hoquiam River West Fork and intermittently along the East Fork. There is little to no road development within shoreline jurisdiction of the Middle Fork. There are approximately five bridges in shoreline jurisdiction. Major and minor roads are listed below.

Major Roads:

- US 101 runs parallel to the Hoquiam River West Fork in reaches 1 through 5. It crosses the West Fork at reaches 4 and 5.

- There are approximately 3 bridges on major roads within shoreline jurisdiction.

Minor Roads:

- Minor roads within shoreline jurisdiction are concentrated along the Hoquiam River East Fork in reaches 1 through 5.
- There are approximately 2 bridges on minor roads within shoreline jurisdiction.

Public Access

Current public shoreline access sites in the AU include one public boat launch on the East Fork Hoquiam River.

Identified conservation easements and protected lands include Hoquiam Surge Plain (Forterra, Capitol Land Trust).

Historic and Archeological Sites

There is one historic site listed in the DAHP inventory of State or National Register of Historic Places in or near shoreline jurisdiction. It has been identified as the Panhandle Bridge. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.6 Wishkah

Summary

The Wishkah AU contains three jurisdictional rivers that have been divided into 11 shoreline analysis reaches. Table 6-10 provides further details on each waterbody's land use characteristics.

Table 6-10. Summary Characteristics of Wishkah AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Wishkah River	2,670	463	• City .... 3% • Conservancy................... 7% • County .... 1% • Private .... 78% • State – Others .... <1% • State – WDFW................ 2% • QIN .... <1% • Unknown....................... <1%

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
			(91%)
Wishkah River, EF	679	87	• County .... 1% • Private 95% (96%)
Wishkah River, WF	804	58	• County .... 13% • Private .... 84% • State – WDFW 2% (98%)

Current and Future Land Use

Current Land Use

Current shoreline land uses in the Wishkah River AU is dominated by forestry (79%). Approximately 4.5% of the shorelines are vacant or undeveloped lands. Residential development (7%) occurs along the rivers in the middle and downstream reaches and is concentrated north of the City of Aberdeen and in the communities of Aberdeen Gardens and Wishkah. Agriculture is also common within shoreline jurisdiction.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The upper reaches of this AU are designated as General Development; the middle reaches are designated as Agriculture; and the lower reaches north of the City of Aberdeen are designated as Urbanizing. These comprehensive land use designations are generally reflected in the County's zoning.

The shorelines are generally zoned A1 from the confluence of the East and West Forks south to Aberdeen. Shoreline uplands north are generally zoned G 5. Both of these zoning districts allow low-density residential development and continued agriculture. An area immediately north of Aberdeen on the west bank of the river is zoned for R2, which allows residential development at a slightly higher density than G 5. Table 6-11 provides a summary of current land use, zoning and current SEDs.

Table 6-11. Wishkah AU Shorelines Land Use, Zoning and Current Shoreline Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Wishkah River	• Forestry ....70% • Residential....9% • Vacant/Undeveloped....7% • TCU ....3% • Agriculture ....2% • Trades and Services ....<1% • CER ....<1% • Unknown ....<1%	• General Dev 5.... 71% • Agricultural 1.... 28% • Residential 1%	• Conservancy • Rural • Urban
Wishkah River, EF	• Forestry ....94% • Residential....2%	• General Dev 5.... 96% • Agricultural 1.... 4%	• Conservancy
Wishkah River, WF	• Forestry ....96% • Residential....3%	• General Dev 5....100%	• Conservancy

Potential Future Land Use

The Wishkah AU's shorelines have limited undeveloped land. The Wishkah River has 132 acres (less than 5% of its shoreline jurisdiction) that are classified as vacant or undeveloped. It is the only waterbody in the assessment unit with vacant or undeveloped lands. Of the 132 vacant acres, 80 are zoned for continued agriculture (A1) and 48 acres are zoned G5. Under those zones continued agriculture and low-density residential development are allowed. Given the lack of higher intensity zoning and growth trends, substantial shoreline development would not be anticipated in this assessment unit.

Water-Oriented Uses

Utility outfalls and intakes are considered water-dependent uses. Water enjoyment uses include parks, open space and the boats launch on the Wishkah River (See Existing and Potential Public Access below). The Washington Marine Spatial Planning project identifies the Quinault Seafood Dock at the end of the Wishkah River. No other water-oriented uses were identified.

Shoreline Permit History

Within the Wishkah AU, 33 shoreline permits have been issued since 1972. Approximately 24 were SDP and nine were of an unknown type. Only three permits have been issued since 2000. Recent projects included grading and filling for a two-story garage; construction of a new

Aberdeen Gardens Road bridge over the Wishkah River and placement of rip rap along 185 feet of eroded river bank.

Transportation

Generally, there is little road and transportation infrastructure development within the shoreline jurisdiction of the Wishkah AU. Roads within shoreline jurisdiction are dispersed along the West Fork Wishkah River and the upstream reaches of the Wishkah River. They are also concentrated in the lower reaches of the Wishkah River (Wishkah River – 1, 2). Transportation facilities are listed below.

- Minor roads within shoreline jurisdiction are dispersed along the Wishkah River in the valley north of Aberdeen, with more concentrated areas in the lower reaches north of Aberdeen (Wishkah River – 1, 2).
- Wynoochee Wishkah Road crosses the Wishkah River East Fork (Reach 1).
- Wishkah Road crosses the Wishkah River where it joins the East Fork (Reach 3) and upstream (Wishkah River – 6).
- West Wishkah Road crosses the Wishkah River where it meets the West Fork (Reach 4).
- Wishkah River Ranch Airport is adjacent to the Wishkah River north of Aberdeen.

Public Access

Identified conservation easements and protected lands are listed below.

- One public boat launch on the Wishkah River downstream of Aberdeen Gardens.
- The WDFW Olympic Wildlife Area: Olympic Unit (963 acres) is located 15 miles north of Aberdeen within the Wishkah River Valley. It provides opportunities for bird watching, boating, fishing, hiking, hunting, mountain biking, and more.

Identified conservation easements and protected lands include the Baretich Conservation Easement (29 acres) is located along the west bank of the Wishkah River near Aberdeen. Permission is needed for entry.

Historic and Archeological Sites

There is one historic site listed in the DAHP Inventory of State or National Register of Historic Places in or near shoreline jurisdiction. It has been identified as the Greenwood Bridge, located north of the confluence with the West Fork.

6.2.7 Wynoochee

Summary

The Wynoochee AU contains 14 jurisdictional rivers and creeks and two lakes. These have been divided into 26 shoreline analysis reaches. Table 6-12 provides further details on each waterbody's characteristics and the number of parcels within or touching shoreline jurisdiction.

Table 6-12. Summary Characteristics of Wynoochee AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Anderson Creek	102	7	• ONF ....79% • Private ....8% • State – Others 12% (100%)
Big Creek 1	235	9	• ONF ....97% • Private 2% (100%)
Bitter Creek	116	8	• Private 100% (100%)
Black Creek	419	117	• Private 95% (95%)
Carter Creek	105	17	• Private 100% (100%)
Falls Creek 2	48	3	• Private 100% (100%)
Harris Creek	91	9	• ONF ....14% • Private ....63% • State – Others 21% (98%)
Save Creek	58	2	• Private 100% (100%)
Schafer Creek	303	20	• County ....5% • Private 95% (100%)
Sylvia Creek	143	36	• City .... 21% • Private 76%

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
			(97%)
Trout Creek	62	2	• ONF 99% (99%)
Wedekind Creek	141	29	• City .... <1% • Private 100% (100%)
Wynoochee Gravel Lake	37	13	• Private 98% (98%)
Wynoochee Lake	278	20	• Federal ....28% • ONF 51% (79%)
Wynoochee River	3,700	449	• City .... <1% • County ....1% • Federal ....3% • ONF ....15% • Private ....68% • State – Others ....4% • State – WDFW....................2% (92%)
Wynoochee River, W B	260	6	• ONF 100% (100%)

Current and Future Land Use

Current Land Use

Current shoreline land use in the Wynoochee River AU is predominated by forestry (51%) occurring primarily in the upper watershed. Generally, agriculture (8%) and residential uses (6%) are concentrated along shoreline areas in the lower half of the basin as it flows south to Grays Harbor. A small amount of manufacturing use occurs near SR 12.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The upper reaches of this AU are designated as General Development. The Lower reaches are designated as Agriculture II. Zoning generally follows these designations with the A2 zoning district, which preserves lands for use by “large commercial farms” (GHC 17.16.010). The downstream area of Black Creek is also zoned for A2. Table 6-13 provides a summary of current land use, zoning and SEDs.

Table 6-13. Wynoochee AU Shorelines Land Use Zoning, and Current Shoreline Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Anderson Creek	• Unknown ..... 79% • Forestry ..... 20% • Vacant/Undeveloped ... <1%	• Not Zoned 100%	• Not designated
Big Creek 1	• Unknown ..... 97% • Forestry 2%	• Not Zoned 100%	• Not designated
Bitter Creek	• Forestry 100%	• General Dev 5 ..... 100%	• Conservancy
Black Creek	• Forestry ..... 68% • Residential ..... 20% • Manufacturing/Industrial 5% • Agriculture ..... 2% • Vacant/Undeveloped ... <1%	• General Dev 5 ..... 52% • Agricultural 1 ..... 48%	• Conservancy
Carter Creek	• Forestry ..... 99% • Agriculture ..... <1%	• General Dev 5 ..... 100%	• Conservancy
Falls Creek 2	• Forestry 100%	• General Dev 5 ..... 100%	• Not designated
Harris Creek	• Forestry ..... 84% • Unknown 14%	• Not Zoned 100%	• Not designated
Save Creek	• Forestry 100%	• General Dev 5 ..... 100%	• Not designated
Schafer Creek	• Forestry 100%	• General Dev 5 ..... 100%	• Conservancy
Sylvia Creek	• Forestry ..... 57% • CER ..... 14% • Residential ..... 13% • Agriculture 13%	• General Dev 5 ..... 51% • Rural Residential ..... 32% • Industrial ..... 10% • Residential 5%	• Rural • Urban
Trout Creek	• Unknown ..... 99 %	• Not Zoned 100%	• Not designated
Wedekind Creek	• Forestry ..... 89% • Residential ..... 6% • CER ..... 4% • Vacant/Undeveloped ... <1% • TCU ..... <1%	• General Dev 5 ..... 95% • Agricultural 2 ..... 5%	• Conservancy
Wynoochee Gravel Lake	• Forestry ..... 38% • Manufacturing/Industrial .31 % • Residential 29%	• Agricultural 2 ..... 66% • General Dev 5 ..... 34%	• Not designated
Wynoochee Lake	• Unknown ..... 51% • Vacant/Undeveloped ... 16%	• Not Zoned 100%	• Not designated

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
	• Forestry .... 10% • Trades and Services 3%		
Wynoochee River	• Forestry .... 50% • Unknown .... 15% • Agriculture .... 13% • Residential..................... 7% • Vacant/Undeveloped ..... 5% • CER .... 2% • Manufacturing/Industrial 1% • Trades and Services ... <1% • TCU .... <1%	• Agricultural 2.............. 44% • General Dev 5 .... 33% • Not Zoned.................. 22% • Agricultural 1................ 1%	• Conservancy
Wynoochee River, W B	• Unknown 100%	• Not Zoned................ 100%	• Not designated

Potential Future Land Use

The Wynoochee AU's shorelines has limited vacant or undeveloped lands that provide capacity for new development. Within the Wynoochee AU, there are approximately 227 vacant or undeveloped acres of shoreline uplands, representing less than 4%of the AU's total shoreline uplands. The acreage and current zoning of those lands are shown for each waterbody in Figure 6-7. Most of the vacant land occurs along the mainstem Wynoochee River. It is comprised predominantly of lands zoned A2 with a smaller amount of G 5. Neither allows or suggests substantial future development. Relatively little capacity exists elsewhere in the AU also suggesting little development is anticipated.

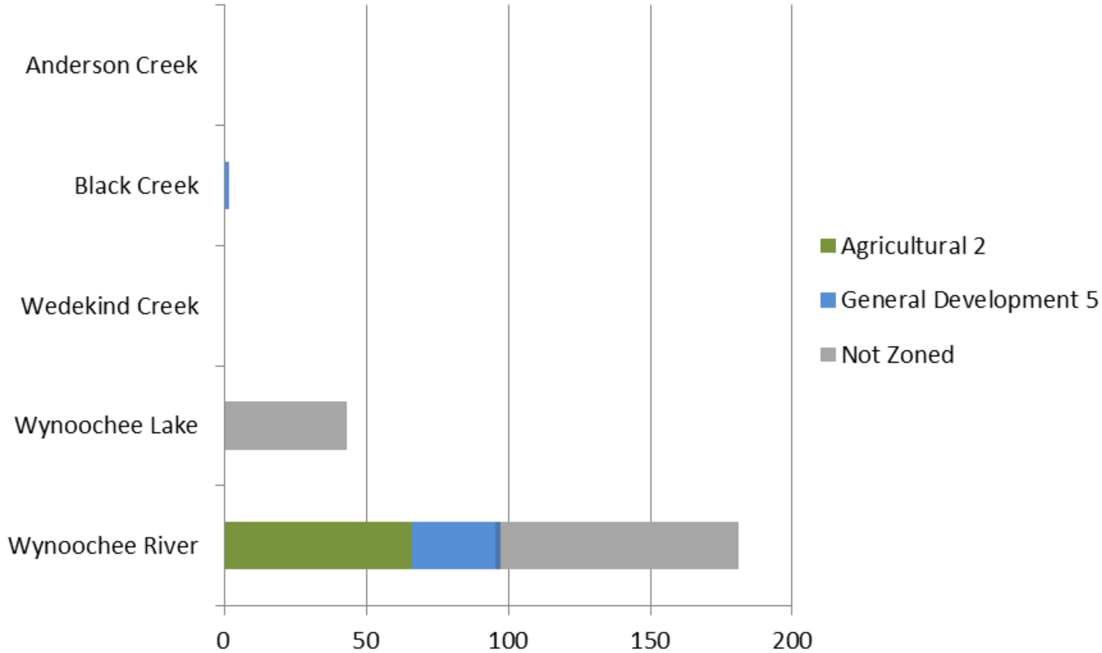


Figure 6-7. Wynoochee AU Zoning of Vacant and Undeveloped Shoreline uplands
(Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Water-Oriented Uses

Utility outfalls and intakes are considered water-dependent uses. The Wynoochee Dam is located south of Wynoochee Lake. A mining operation is located upstream of the SR 12 bridge. The operation's need for a shoreline location is not known. Water enjoyment uses include parks, open space and boat launches on the Wynoochee River. See Existing and Potential Public Access below.

Shoreline Permit History

Within the Wynoochee AU, 86 shoreline permits have been issued since 1972. Of those, 31 are of an unknown type. Approximately 54 were SDP and one was a CUP. Only three permits have been issued since 2000.

Transportation

Generally, the Wynoochee River AU has few roads or transportation infrastructure in shoreline jurisdiction. Roads tend to be concentrated along the lower reaches of Black Creek where it joins the Wynoochee River (Black Creek – 1, 2, 3). They are also dispersed along the middle and downstream reaches of the Wynoochee River (Wynoochee River – 3, 4). There are approximately 13 bridges in shoreline jurisdiction. Major and minor roads are listed below.

Major roads:

- US 12 crosses the Wynoochee River near the river's mouth where it joins the Chehalis River (Wynoochee River – 2).

Minor roads:

- Minor roads in shoreline jurisdiction occur mostly in the middle and downstream sections of the Wynoochee River and along Black Creek.
- Upstream, Donkey Creek Road crosses Harris Creek (Harris Creek – 1) and the Wynoochee River (Wynoochee River – 5, 6).
- There are approximately 12 bridges on minor roads within shoreline jurisdiction.

Public Access

Identified conservation easements and protected lands are listed below.

- Two public boat launches on the Wynoochee River and one on Wynoochee Lake.
- Public access is also available in the Olympic National Forest and Elk Picnic Ground on the Wynoochee River.
- The WDFW Olympic Wildlife Area: Olympic Unit (963 acres) is located 15 miles north of Aberdeen with parcels scattered throughout the Wynoochee River drainages. It provides opportunities for bird watching, boating, fishing, hiking, hunting, mountain biking, and more.
- Sterling Landing (30 acres) is primarily undeveloped land with a gravel boat launch just outside Montesano. It is now owned by the Port of Grays Harbor.

Historic and Archeological Sites

There is one historic site listed in the DAHP inventory of State or National Register of Historic Places in or near shoreline jurisdiction. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.8 Satsop

Summary

The Satsop AU contains nine jurisdictional rivers and creeks. These have been divided into 16 shoreline analysis reaches. Table 6-4 provides further details on each waterbody's characteristics and the number of parcels within or touching shoreline jurisdiction.

Table 6-14. Summary Characteristics of Satsop AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Canyon River	515	24	• Private 100% (100%)
Decker Creek	145	8	• Private 100% (100%)
Little River	130	8	• Private 100% (100%)
Satsop River	1,343	128	• County ....<1% • Port of Grays Harbor ......1% • Private ....86% • State – Others ....<1% • State – WDFW................4% (93%)
Satsop River, EF	494	239	• Private 90% (90%)
Satsop River, MF	839	216	• Private ....88% • State – Others ....<1% (88%)
Satsop River, WF	2,317	238	• Federal ....<1% • ONF ....20% • Private 75% (95%)
Smith Creek	92	4	• Private 100% (100%)
Still Creek	154	7	• Private 100% (100%)

Current and Future Land Use

Current Land Use

Current shoreline land use in the Satsop River AU is primarily classified as forestry (58%), which is located in the upper watershed. Agriculture accounts for 18% of shoreline land use. South of SR 12, the shorelines are undeveloped or in agricultural use. North of SR 12, land use is a mix of agriculture and low density residential development. Agriculture and residential land use is concentrated along shoreline areas in the lower half of the UA as it flows south to the Chehalis River. There is nearly no commercial use along the Satsop River and its tributaries.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The County's Comprehensive Land Use Map designates the upper reaches of this AU (outside of the Olympic National Forest) as Agriculture II and General Development. Zoning implements these designations. The lower reaches are zoned as A2, which intends to preserve lands for use by "large commercial farms" (GHC 17.16.010). The middle reaches are zoned as a mix of A2 and G5. The upper reaches are located within the National Forest. Table 6-15 provides a summary of current land use, zoning and current SEDs.

Table 6-15. Satsop AU Shorelines Land Use, and Current Shoreline Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Canyon River	• Forestry.....100%	• General Dev 5..... 100%	• Conservancy
Decker Creek	• Forestry.....83% • Vacant/Undeveloped ..17%	• General Dev 5..... 100%	• Conservancy
Little River	• Forestry.....100%	• General Dev 5..... 100%	• Conservancy
Satsop River	• Agriculture.....66% • Forestry.....14% • Residential.....6% • Vacant/Undeveloped ....4% • TCU .....1% • CER .....1% • Trades and Services...<1%	• Agricultural 2..... 90% • Agricultural 1..... 7% • General Dev 5..... 2% • Satsop Multi-use District.... 1%	• Conservancy
Satsop River, EF	• Forestry.....31% • Residential.....23% • Agriculture.....19% • CER .....12% • Vacant/Undeveloped 4%	• Agricultural 2..... 90% • General Dev 5.....10%	• Conservancy
Satsop River, MF	• Forestry.....69% • Agriculture.....10% • Residential.....7% • CER 2%	• Agricultural 2..... 74% • General Dev 5..... 26%	• Conservancy
Satsop River, WF	• Forestry.....67% • Unknown.....20% • Residential.....6% • Agriculture.....1% • Vacant/Undeveloped ..<1%	• General Dev 5..... 62% • Not Zoned..... 20% • Agricultural 2..... 18%	• Conservancy
Smith Creek	• Forestry.....100%	• General Dev 5..... 100%	• Not designated
Still Creek	• Forestry.....99%	• General Dev 5 – 98%	• Not designated

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
	• Residential....................1%	• Agricultural 2 – 2%	

Potential Future Land Use

The Satsop AU's shorelines have very limited shoreline lands that provide capacity for new development. Within the Satsop AU, there are only 89 acres classified as vacant or undeveloped, representing less than 2% of the AU's total shoreline uplands. The acreage and current zoning of those lands are shown for each waterbody in Figure 6-8. Most of the vacant land (62%) is zoned A2, which seeks to preserve large farms and allows only very low density residential development. Much of the remaining vacant land is zoned G5 (37%). Neither suggests significant future development. Relatively little capacity exists elsewhere in the AU also indicating that little development is anticipated.

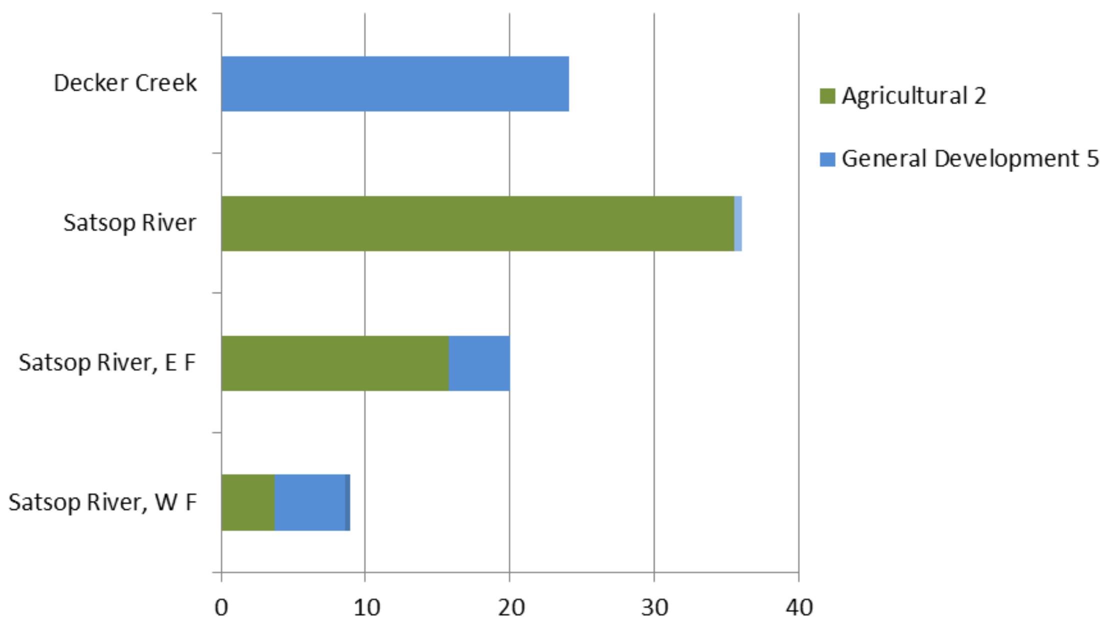


Figure 6-8. Satsop AU Zoning of Vacant and Undeveloped Shoreline uplands (Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Water-Oriented Uses

Utility outfalls and intakes are considered water-dependent uses. There are two dams on the East Fork Satsop River. Water enjoyment uses include parks, open space and a boat launch on the Satsop River. See Public Access below.

Shoreline Permit History

Within the Satsop AU, 47 shoreline permits have been issued since 1972. Of those, 17 are of an unknown type and 29 were SDP. Seven permits have been issued since 2000. These were all for public utility and transportation infrastructure projects.

Transportation

Generally, there is little road and transportation infrastructure development in the Satsop AU shoreline jurisdiction. Roads tend to be concentrated in the downstream sections of the Satsop River where it meets the Chehalis River and along downstream sections of the Satsop West and East Forks. There are approximately 8 bridges in shoreline jurisdiction. Transportation facilities are listed below.

Major roads:

- US 12 crosses the Satsop River just north of where it joins the Chehalis River (Satsop River – 1).

Minor roads:

- Minor roads within shoreline areas are concentrated in the downstream sections of the Satsop River and its Middle, West and East Forks.
- Cougar Smith Road and Boundary Road cross the Satsop River MF– 3.
- Satsop Riviera Loop is completely within shoreline jurisdiction (Satsop River EF – 1).
- Monte Elma Road crosses the Satsop River parallel to US 12 in Satsop River– 1.

Other:

- A railroad is within shoreline jurisdiction as it crosses the Satsop River near the mouth of the river (Satsop River – 1).

Public Access

Identified conservation easements and protected lands are listed below.

- 467 acres of shoreline in the Olympic National Park.
- There are two boat launches identified along the Satsop River. The first near SR 12 and the second upstream near the confluence with the East Fork Satsop River.
- Schafer State Park is a 119 acre park on the Satsop River, halfway between Olympia and Ocean Park. It provides opportunities for camping, hiking, fishing, swimming, and wildlife viewing.

- The Satsop Unit (1,432 acres) of the WDFW Chehalis Wildlife Area is located near the confluence of the Satsop River and Chehalis River. It is maintained for floodplain habitat. It provides opportunities for outdoor activities such as bird watching, fishing, hiking, hunting and wildlife viewing.

Historic and Archeological Sites

There are two historic sites listed in the DAHP Inventory of State or National Register of Historic Places in or near shoreline jurisdiction. Only one is identified, the Satsop River Bridge. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.9 Cloquallum and Mox Chehalis

Summary

The Cloquallum AU contains eight jurisdictional rivers and creeks and one jurisdictional lake (McCleary Pond). Table 6-16 provides further details on each waterbody's land use characteristics.

Table 6-16. Summary Characteristics of Cloquallum AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Cloquallum Creek	467	113	• City .... 1% • Conservancy .... 1% • Private .... 64% • State – Others 1% (67%)
McCleary Pond	24	7	• Private 99% (99%)
Mox Chehalis Creek	538	164	• City .... 1% • County .... <1% • Private .... 75% • State – DNR .... 2% • State – Others 2% (81%)
Newman Creek	212	101	• Private .... 71% • (71%)
Sand Creek	152	21	• Private 96%

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
			(96%)
Wildcat Creek	146	63	• Private 82% (82%)
Wildcat Creek, EF	108	23	• Private ....74% • State – Other 5% (78%)
Wildcat Creek, EF, UT	67	44	• Private 84% (84%)
Wildcat Creek, WF	45	11	• Private 94% (94%)

Current and Future Land Use

Current Land Use

The predominant shoreline uses in the Cloquallum River AU are forestry (51%) and residential (34%). Generally, residential and agricultural land uses are concentrated along Cloquallum Creek, Wildcat Creek West Fork, East Fork, Mox Chehalis Creek and Norman Creek particularly near the communities of Elma, McCleary, Greenwood and Malone. Commercial, manufacturing, and recreational uses are generally concentrated in shoreline areas around Elma.

Comprehensive Land Use Plan, Zoning, and Shoreline Designations

The County's Comprehensive Land Use Map designates the shoreline within this AU a mix of residential and agricultural types. Zoning generally implements these designations. Wildcat Creek' shorelines are zoned with a mix of residential zoning districts. Newman and Mox Chehalis Creek shorelines are zoned primarily A1. The remaining shorelines are dominated by G5 zoning. Table 6-17 provides a summary of current land use, zoning and SEDs.

Table 6-17. Cloquallum AU Shorelines Land Use, Zoning and Shoreline Environment Designation by Reach
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Cloquallum Creek	• Forestry .... 41% • Residential .... 22% • Manufacturing/Industrial. 2% • Vacant/Undeveloped...... 2%	• General Dev 5 .... 82% • Rural Residential .... 10% • Industrial 7%	• Conservancy • Rural
McCleary Pond	• Forestry .... 89% • Residential 10%	• General Dev 5 .... 83% • General Dev 1 .... 17%	• Not designated
Mox Chehalis Creek	• Forestry .... 47% • Residential .... 30% • Vacant/Undeveloped...... 3% • CER........ 1%	• General Dev 5 .... 65% • Agricultural 1............... 29% • Rural Residential 6%	• Conservancy • Rural
Newman Creek	• Residential .... 41% • Forestry .... 17% • Agriculture .... 11% • CER........ 2%	• Agricultural 1.............. 77% • General Dev 5 .... 23%	• Conservancy • Rural
Sand Creek	• Forestry 96%	• General Dev 5 .... 100%	• Not designated
Wildcat Creek	• Residential .... 48% • Forestry .... 23% • Manufacturing/Industrial. 7% • Vacant/Undeveloped...... 5% • Trades and Services .... <1%	• General Dev 5 .... 88% • Rural Residential 12%	• Rural
Wildcat Creek, EF	• Forestry .... 57% • Residential .... 11% • Agriculture .... 8% • Vacant/Undeveloped...... 2%	• General Dev 5 .... 98% • Rural Residential 2%	• Rural
Wildcat Creek, EF, UT	• Residential .... 75% • Forestry .... 4% • Vacant/Undeveloped...... 4%	• Rural Residential .... 56% • General Dev 5 .... 37% • Agricultural 2................ 7%	• Rural
Wildcat Creek, WF	• Forestry .... 54% • Residential .... 38% • Vacant/Undeveloped...... 2%	• General Dev 5 .... 100%	• Rural

Potential Future Land Use

The Cloquallum AU's shorelines have limited shoreline lands classified as vacant or undeveloped (33 acres). The acreage and current zoning of those lands are shown for each waterbody in Figure 6-9. The vacant lands are zoned for a mix of G5 and RR. Based on the current land use pattern, with development located around Elma and McCleary and the areas development capacity and zoning, this area could experience more demand for future shoreline use than others. However, the acreage of vacant land is relatively low indicating a small amount of potential future shoreline development.

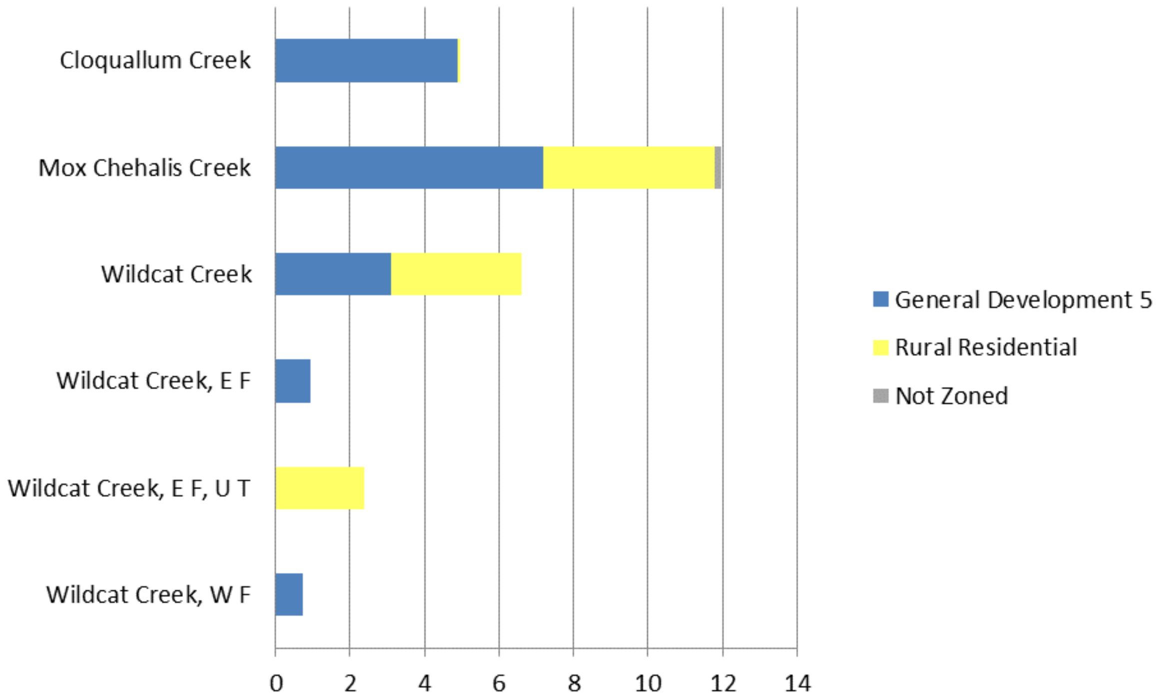


Figure 6.9. Cloquallum AU Zoning of Vacant and Undeveloped Shoreline uplands
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Water-Oriented Uses

Utility outfalls and intakes are considered water-dependent uses. Activities such as fishing, boating and swimming are also considered water-oriented. Water enjoyment uses include parks and open space. However, no formal public access sites are identified in this AU.

Shoreline Permit History

Within the Cloquallum AU, 14 shoreline permits have been issued since 1972. Approximately nine were SDP, one was a CUP and four were of an unknown type. Only one permit has been issued since 2000 for a shoreline armoring project on Wildcat Creek.

Transportation

Generally, there is moderate road development within shoreline jurisdiction of the Cloquallum AU. There is a large concentration or roads within shoreline jurisdiction along Cloquallum Creek, Wildcat Creek, and Newman Creek. There are approximately 15 bridges in shoreline jurisdiction. Transportation facilities are listed below.

Major Roads:

- SR 8 crosses Cloquallum Creek near Elma (Cloquallum Creek – 2). It also runs adjacent to Wildcat Creek for just under a mile along an upstream stretch of the creek (Wildcat Creek – 2; Wildcat Creek, EF – 1).
- US 12 crosses Mox Chehalis Creek near the mouth of the creek where it meets the Chehalis River (Mox Chehalis Creek – 1).

Minor Roads:

- Minor roads within shoreline areas tend to be concentrated along Cloquallum Creek, Wildcat Creek, and Newman Creek.
- Sections of Mox Chehalis Road are within shoreline jurisdiction of Mox Chehalis Creek in Reaches 2 through 4.
- Nearly 2 miles of Cloquallum Road is within shoreline jurisdiction of Cloquallum Creek (Cloquallum Creek – 4).

Other:

- Railroad infrastructure is within shoreline jurisdiction. The railroad crosses Newman Creek (Newman Creek – 2), Cloquallum Creek (Cloquallum Creek – 2), and Wildcat Creek (Wildcat Creek – 1; Wildcat Creek WF – 1; Wildcat Creek EF – 1).

Public Access

There are no identified public access sites in the AU.

Historic and Archeological Sites

There are no historic sites listed in the DAHP Inventory of State or National Register of Historic Places in or near shoreline jurisdiction. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.10 Chehalis

Summary

The Chehalis AU contains 18 jurisdictional rivers and creeks and one jurisdictional lake (Moores Lake). Table 6-8 provides further details on each waterbody’s land use characteristics and the number of parcels within or touching shoreline jurisdiction.

Table 6-18. Summary Characteristics of Chehalis AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Black River	333	99	• County ....<1% • Federal ....10% • Private ....36% • State – DNR ....1% • State – WSDOT..............2% • CIT ....30% • Unknown.........................1% (80%)
Cedar Creek South	405	78	• Private ....30% • State – DNR ....4% • State – Others ....57% • CIT 7% (98%)
Chehalis River	8,561	702	• City ....<1% • Conservancy...................1% • County ....2% • Federal ....<1% • Port of Grays Harbor ......1% • Private ....46% • State – DNR ....29% • State – Others ....3% • State – WDFW ....2% • State – WSDOT............<1% • CIT ....4% • Unknown.......................<1% (87%)
Cloquallum Creek	174	355	• Private 27% (27%)
Delezene Creek	351	18	• Private 98% (98%)
Quigg Lake	31	74	• Port of Grays Harbor
Garrard Creek	411	4	• Private ....76% • State – DNR ....<1% • CIT 11% (87%)
Garrard Creek, SF	62	99	• Private 95% (95%)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Gibson Creek	47	17	• Private .... 77% • State – DNR 13% (90%)
Moores Lake	105	13	• County .... 9% • Private .... 73% • State – Others .... <1% (82%)
Mox Chehalis Creek	107	24	• Private 15% (15%)
Newman Creek	70	13	• Private .... 12% • State – WDFW 12% (24%)
Porter Creek	343	16	• Conservancy .... 3% • County .... <1% • Private .... 35% • State – DNR .... 14% • State – Others 45% (97%)
Porter Creek, NF	204	85	• State – Others 100% (100%)
Porter Creek, WF	109	6	• State – Others 100% (100%)
Rock Creek	445	9	• Private .... 48% • State – DNR .... 45% • State – Others 2% (96%)
Vance Creek	799	86	• City .... <1% • County .... 3% • Private .... 45% • State – Others .... 3% • State – WDFW 45% (96%)
Williams Creek	140	90	• Private .... 87% • State – DNR 11% (98%)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Workman Creek	290	38	• County .... 2% • Private 95% (97%)

Current and Future Land Use

Current Land Use

The largest component of land use in the Chehalis River AU is vacant and undeveloped land, which comprises 58% of the total shoreline area. Forestry comprises another 20% and agriculture accounts for 12% of the shoreline uplands. Agriculture is concentrated around the Chehalis River from the southeast corner of the County north and northwest through the cities of Oakville, Elma, Montesano, and Central Park. A particularly large area of agricultural land use occurs between the Satsop River on the east and Montesano on the west.

Residential land use is concentrated in shoreline areas near Oakville, Elma, Montesano, Chehalis Village, Balch, the Chehalis Indian Reservation, Cedarville, Lankner, Porter, Rony, Malone, Saginaw, South Elma, Fuller, Alder Grove, and Central Park. Concentrated areas of manufacturing, utilities and transportation occur near the town of Fuller and near the boundaries of the Cities of Cosmopolis and Aberdeen. Major recreational shoreline land uses are located around developed areas such as Oakville and Elma. The Elma Municipal Airport is adjacent to Moores Lake and classified as a transportation use.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The Chehalis AU is a large and varied landscape. The County's Comprehensive Land Use Map designates most of its shorelines as Agricultural I, Industrial, and Urbanizing. The Satsop Business Park carries its own designation. Zoning implements the land use designations closely. Shorelines from the southeast of the County are largely zoned A2 through Montesano. Between Montesano and Cosmopolis zoning is a mix of G5 south of the Chehalis River, R2 north of the River and I2 east of Aberdeen and Cosmopolis. Table 6-19 provides a summary of current land use, zoning and SEDs.

Table 6-19. Chehalis AU Shorelines Land Use, Zoning, and Shoreline Environment Designation by Waterbody.
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use*	County Zoning	Current Shoreline Environment Designation
Black River	• Forestry .... 24% • Agriculture .... 23% • Unknown .... 11% • Residential.................. 11% • CER .... 6% • Vacant/Undeveloped 5%	• Agricultural 2 .... 47% • Not Zoned.................. 44% • General Dev 5 .... 9%	• Conservancy
Cedar Creek South	• Forestry .... 74% • Agriculture .... 10% • Residential.................... 9% • CER .... 3% • Vacant/Undeveloped 1%	• General Dev 5- 77% • Agricultural 2 .... 23%	• Conservancy
Chehalis River	• Forestry .... 39% • Vacant/Undeveloped .. 29% • Agriculture .... 10% • CER .... 4% • Residential.................... 3% • Manufacturing/Industrial 2% • Unknown .... <1% • TCU .... <1% • Trades and Services .. <1%	• General Dev 5 .... 15% • Commercial .... 21% • Industrial..................... 21% • Agricultural 2 .... 12% • Satsop Multi-Use District .... 2% • Not Zoned..................... 8% • Residential (Gen) .... 14% • Residential (Restricted) 7%	• Conservancy
Cloquallum Creek	• Agriculture .... 14% • Forestry .... 10% • Vacant/Undeveloped .... 1% • Residential.................... 1%	• Agricultural 2 .... 99% • Industrial....................... 1%	• Conservancy
Delezene Creek	• Forestry .... 68% • Residential.................. 22% • CER .... 4% • Agriculture .... 3% • Vacant/Undeveloped .. <1%	• General Dev 5 .... 97% • Agricultural 2 .... 3%	• Conservancy
Quigg Lake	• CER .... 92% • Forestry .... 7% • Vacant/Undeveloped .. <1%	• General Dev 5 .... 100%	• Undesignated
Garrard Creek	• Forestry .... 49% • Agriculture .... 25% • Residential.................. 14%	• Agricultural 2 .... 95% • General Dev 5 .... 5%	• Conservancy
Garrard Creek, SF	• Residential.................. 54% • Forestry .... 40% • Agriculture .... <1%	• Agricultural 2 .... 100%	• Conservancy
Gibson Creek	• Residential.................. 51% • Forestry 35%	• General Dev 5 .... 80% • Agricultural 2 .... 20%	• Undesignated

Jurisdictional Waterbody	Existing Land Use*	County Zoning	Current Shoreline Environment Designation
	• Agriculture 5%		
Moores Lake	• CER .... 48% • Forestry .... 27% • Vacant/Undeveloped .... 5% • Residential.................... 1% • TCU .... <1%	• Agricultural 2 .... 93% • General Dev 5 .... 7%	• Undesignated
Mox Chehalis Creek	• Agriculture .... 9% • CER .... 5% • Vacant/Undeveloped .... 1% • Forestry .... <1 %	• Agricultural 2 .... 99% • General Dev 1 .... 1% •	• Conservancy
Newman Creek	• Agriculture .... 12% • Forestry 12%	• Agricultural 2 .... 82% • Agricultural 1 .... 18%	• Conservancy
Porter Creek	• Forestry .... 77% • Agriculture .... 10% • Residential.................. 10% • Trades and Services .... 1% • Vacant/Undeveloped .. <1%	• General Dev 5 .... 72% • Agricultural 1 .... 20% • General Dev 1 .... 6% • Agricultural 2 .... 2%	• Conservancy • Rural
Porter Creek, NF	• Forestry 100%	• General Dev 5 .... 100%	• Conservancy
Porter Creek, WF	• Forestry 100%	• General Dev 5 .... 100%	• Conservancy
Rock Creek	• Forestry .... 72% • Residential.................. 14% • Agriculture .... 9% • Vacant/Undeveloped .. <1%	• General Dev 5 .... 76% • Agricultural 2 .... 24%	• Conservancy
Vance Creek	• Forestry .... 65% • Agriculture .... 12% • CER .... 7% • Manufacturing/Industrial 6% • Vacant/Undeveloped .... 3% • Residential.................... 2% • TCU .... 1% • Trades and Services .. <1%	• Agricultural 2 .... 62% • General Dev 5 .... 30% • Industrial 8%	• Conservancy
Williams Creek	• Residential.................. 51% • Forestry 47%	• General Dev 5 .... 55% • Agricultural 1 .... 44%	• Conservancy
Workman Creek	• Forestry .... 74% • CER .... 11% • Agriculture .... 6% • Residential.................... 5% • Vacant/Undeveloped .. >1%	• General Dev 5 .... 83% • Agricultural 2 .... 17%	• Conservancy

* Where percentages are less than 100%, data is not available.

Potential Future Land Use

This AU's shorelines have limited undeveloped shoreline lands in most of the waterbodies. With the exception of the Chehalis River, all of the waterbodies have less than 25 acres of undeveloped shoreline land. Most of that land is zoned for agriculture (A2) or low-density development G5, which allows residential at one dwelling unit per 5 acres.

A third of the Chehalis River shoreline lands – an area of roughly 2,500 acres - are classified as vacant or undeveloped. The majority of these lands are zoned as G5 (1,251 acres), which allows a variety of low density development types. The G5 lands allow residential development at one dwelling unit per acre. At a full build-out of the undeveloped shoreline area, that would equate to 250 homes along the County's entire Chehalis River shoreline. However, only a portion of each of these parcels is within shoreline jurisdiction. Most residential development is likely to occur at various locations on a given parcel.

Much of the vacant land is zoned Industrial (386 acres). The industrial lands provide capacity for new development, particularly near the urban areas of the County. Capacity exists for future development in all of those areas. However, the slow rate of growth in the County suggests that the capacity will not be utilized to a great degree in the near term.

Water-Oriented Uses

Within the Chehalis AU, water-dependent uses include recreational boat launches on the Black River and on the Chehalis River north of Oakville, Porter, Fuller, and south of Montesano. Water-oriented uses would also include utility outfalls and intakes. Water enjoyment uses include parks and open space and boat launches. See Existing and Potential Public Access below.

Shoreline Permit History

Within the AU, 184 shoreline permits have been issued since 1972. These include 114 SDPs, three CUPs, three variances and 64 of an unknown type. There have been 29 shoreline permits issued since 2000.

Transportation

Generally, there is moderate road and transportation infrastructure development in the shoreline jurisdiction of the Chehalis AU. The Chehalis River shorelines contain a majority of the road development, particularly in the areas near Oakville, Porter, Elma, Montesano and Aberdeen. There are approximately 23 bridges within shoreline jurisdiction. Transportation facilities are listed below.

Upstream (Near Southeast Corner of County to Elma)
Major Roads:

- US 12 is intermittently within shoreline jurisdiction as it follows the Chehalis River from the southeast corner of Grays Harbor County near Oakville northwest towards Montesano. There is a particularly large stretch of the highway within shoreline jurisdiction near the mouth of Porter Creek (Porter Creek – 1) and Mox Chehalis Creek (Chehalis River - 10).

Minor Roads:

- Generally, minor roads within shoreline areas tend to be concentrated in the river valleys near Oakville, Porter and Elma. These tend to be concentrated near Black River (Black River – 2), Garrard Creek (Garrard Creek – 1), and Delzene Creek (Delzene Creek – 3).

Downstream (Elma to Montesano)
Major roads:

- SR 107 crosses the Chehalis River south of Montesano (Chehalis River – 4). It is within shoreline jurisdiction in the area between Montesano and Aberdeen (Chehalis River – 2).
- US 12 is within shoreline jurisdiction of the Chehalis River around Elma (Vance Creek – 1; Chehalis River – 8) and Aberdeen (Chehalis River – 2).

Minor roads:

- Generally, minor roads within shoreline jurisdiction tend to be concentrated around Elma, Montesano and Aberdeen, particularly the area around Moores Lake (Moores Lake – 1), Workman Creek (Workman Creek – 2), Vance Creek (Vance Creek – 1; Chehalis River – 8, 9), and the lower reaches of the Chehalis River (Chehalis River – 1, 2, 3).

Other:

- Railroad infrastructure is within shoreline jurisdiction intermittently from Aberdeen to Montesano (Chehalis River – 2).
- D and B Airpark is adjacent to the Chehalis near the mouth of Delzene Creek and S Bank Road (Chehalis River – 4).
- Gold Beach Aviation Elma Airport is adjacent to Moores Lake shoreline areas (Moores Lake – 1).

Public Access

Identified public access sites in the AU are listed below.

- Lower Chehalis, Harris Block and Capitol State Forests
- Lions Park (County)
- Vance Creek County Park is located about a mile south of Elma. It provides opportunities for fishing, picnics, and swimming. It also has a boat launch at Pond #2.
- Boat Launches on the Black River (1) and Chehalis River (4)
- DNR: Chehalis River Surge Plain NAP is a large wetland area at the lower end of the Chehalis River, just upstream from where it meets Grays Harbor. It contains a 3.5 mile trail and wildlife viewing for educational and public access purposes. There are plans to acquire more land for the NAP.
- Forterra also owns 72 acres of the Chehalis River Surge Plain, a high-quality tidal surge plain wetland between Aberdeen and Montesano.
- Campgrounds on Cedar Creek, Quigg Lake and Porter Creek.
- WDFW Chehalis Wildlife Area (2,160 acres) contains four units that are located in the Chehalis River Valley.
  - The Chehalis Unit (531 acres) is located southwest of Elma and provides opportunities for outdoor activities including bird watching, boating, fishing, hiking, hunting and wildlife viewing.
- The Ferbrache Unit (114 acres) is located 5 miles southeast of Montesano. It provides opportunities for bird watching, fishing, hiking, hunting, and wildlife viewing.
- The Hoxit Unit (80 acres) is located 1.5 miles south of Porter and provides opportunities for bird watching, fishing, hiking, hunting, and wildlife viewing.
- The Satsop Unit (1,432 acres) is located near the confluence of the Satsop River and Chehalis River. It is maintained for floodplain habitat. It provides opportunities for outdoor activities such as bird watching, fishing, hiking, hunting and wildlife viewing.
- Friends Landing (152 acres) is a Grays Harbor County Parks and Recreation site developed and provides opportunities for fishing, swimming, and outdoor activities. It was specifically designed to provide recreational opportunities for people with disabilities.

Identified conservation easements and protected lands are listed below.

- Gordon Farm Conservation Easement (Capitol Land Trust)
- Porter site (Chehalis River Basin Land Trust)
- Kimber parcel (Chehalis River Basin Land Trust)

Historic and Archeological Sites

There are 12 historic sites in the DAHP Inventory of State or National Register of Historic Places in or near shoreline jurisdiction. Not all sites have been identified by name. Those that are include Sickman Ford Bridge - Main Span and Chehalis River Bridge.

Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.11 North River

Summary

The North River AU contains 8 jurisdictional rivers and creeks. These have been divided into 12 shoreline analysis reaches. Table 6-20 provides further details on each waterbody's characteristics and the number of parcels within or touching shoreline jurisdiction.

Table 6-20. Summary Characteristics of North River AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Elkhorn Creek	34	1	• Private 100% (100%)
Little North River	615	97	• Private ....95% • State – Other ....<1% (96%)
Lower Salmon Creek	437	22	• Private 97% (97%)
North River	2,793	411	• Private ....89% • State – Other ....<1% (89%)
Pioneer Creek	250	40	• Private 98% (98%)
Raimie Creek, R F	157	12	• Private ....63% • State – DNR 37% (100%)
Salmon Creek	312	14	• Private 100% (100%)
Vesta Creek	613	48	• Private 99%

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
			(99%)

Current and Future Land Use

Current Land Use

Current shoreline land uses in the Willapa (North River) AU is dominated by forestry, according to County Assessor data. Residential and agricultural land uses generally occur along the stretch of the North River and its tributaries around Vesta and Artic. Recreational land use is concentrated near Artic.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

This AU is primarily designated as General Development. Much of the shorelines along the North River are designated Agricultural 2. Zoning implements the land use designations closely. Most of the shorelines are zoned G5. Shorelines along the North River are zoned A1. Table 6-21 provides a summary of current land use, zoning and current SEDs.

Table 6-21. North River AU Shorelines Land Use, Zoning and Shoreline Current Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 2013, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Elkhorn Creek	• Forestry 100%	• General Dev 5 .... 100%	• Conservancy
Little North River	• Forestry .... 88% • Residential .... 5% • CER .... 2% • Trades and Services .... 1% • Vacant/Undeveloped .. >1%	• General Dev 5 .... 100%	• Conservancy
Lower Salmon Creek	• Forestry 97%	• General Dev 5 .... 100%	• Conservancy
North River	• Forestry .... 75% • Residential .... 10% • Agriculture .... 2% • Vacant/Undeveloped .... 1% • Trades and Services .. <1%	• General Dev 5 .... 74% • Agricultural 1 .... 26%	• Conservancy
Pioneer Creek	• Forestry .... 93% • Vacant/Undeveloped .... 4% • Residential 1%	• General Dev 5 .... 97% • Agricultural 1 .... 3%	• Conservancy

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Raimie Creek, R F	• Forestry 100%	• General Dev 5 .... 100%	• Conservancy
Salmon Creek	• Forestry 100%	• General Dev 5 .... 100%	• Conservancy
Vesta Creek	• Forestry .... 98% • Residential 2%	• General Dev 5 .... 90% • Agricultural 1 .... 10%	• Conservancy

Potential Future Land Use

The North River AU's shorelines have limited shoreline lands that provide capacity for new development. Within the North River AU, there are approximately 49 acres of shoreline classified as vacant or undeveloped. The acreage and current zoning of those lands are shown for each waterbody in Figure 6-10. Most of the vacant shoreline land is located along the North River. It is zoned either A1 or G5. Both allow residential development, but at very low densities. Relatively little capacity exists elsewhere in the AU also suggesting that slow development should be anticipated.

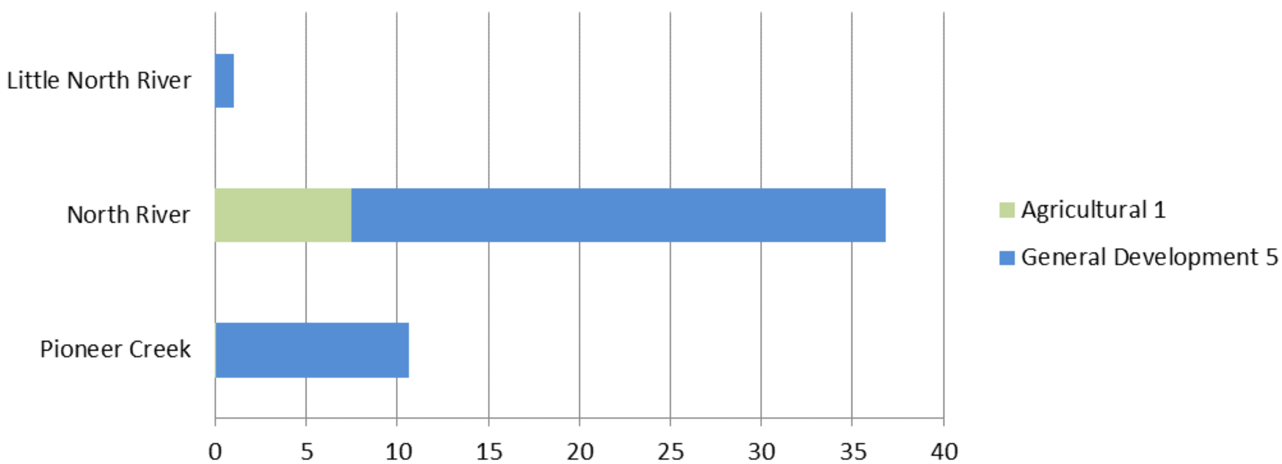


Figure 6-10. North River AU Zoning of Vacant and Undeveloped Shoreline uplands (Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Water-Oriented Uses

Water-dependent uses include a dam on the North River south of Salmon Creek. Activities such as fishing, swimming and boating are also potential water-oriented uses.

Shoreline Permit History

Within the North River AU, 16 shoreline permits have been issued since 1972. Approximately 14 were SDP and the other two were of an unknown type. Since 2000, six shoreline permits applications were issued. Permits were for re-construction of a bridge over Salmon Creek and roadways near the north River.

Transportation

Generally, there is little road and transportation infrastructure development in shoreline jurisdiction. Roads that are within shoreline jurisdiction are concentrated on the North River east of US 101 and the downstream reaches of the Little North River (Little North River – 1). There are approximately five bridges within shoreline jurisdiction. Major and minor roads are listed below.

Major Roads:

- US 101 crosses the midstream section of the North River (North River – 3). It is also within shoreline areas of the Little North River where US 101 meets SR 107 (Little North River – 1). US 101 crosses Lower Salmon Creek (Lower Salmon Creek – 1).

Minor Roads:

- Minor roads within shoreline jurisdiction are concentrated along the upper reaches of the North River east of US 101 (North River – 4, 5).

Other:

- Banas Field (landing field) is adjacent to the North River (North River – 5).

Public Access

There are no identified public access sites in this AU.

Historic and Archeological Sites

There are no historic sites identified in the DAHP's list of Washington State or National Register of Historic Places. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.12 South Grays Harbor Tributaries

Summary

The South Grays Harbor Tributaries AU contains five jurisdictional rivers and creeks. Table 6-22 provides further details on each waterbody's characteristics and the number of parcels within or touching shoreline jurisdiction.

Table 6-22. Summary Characteristics of South Grays Harbor Tributaries AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Andrews Creek	30	4	• Private ....28% • State – DNR 72% (100%)
Charley Creek	368	38	• City ....10% • Port of Grays Harbor ....17% • Private 70% (98%)
Elk River	500	24	• County ....20% • Private ....16% • State – DNR 63% (99%)
Johns River	1,314	104	• County ....2% • Private ....43% • State – WDFW..........51% (96%)
Newskah Creek	370	81	• City ....1% • Port of Grays Harbor ......1% • Private ....89% • State – WDFW..........4% (95%)

Current and Future Land Use

Current Land Use

Current shoreline land use in the South Grays Harbor Tributaries AU is primarily classified as either forestry (63%) or vacant/undeveloped (22.5%) according to County Assessor data. Agricultural (192 acres) and residential uses (62 acres) occur downstream along Charley Creek and Newskah Creek. Small areas of commercial use occur near Grays Harbor. Johns River State Wildlife area is located at the mouth of the Johns River as it meets the waters of Grays Harbor.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

This AU is primarily designated as General Development with the exception of the areas near Gray Harbor along the Johns River, which are designated as Urbanizing. Nearly all of the AU is zoned G5. The exceptions are small areas at the downstream ends of Charley Creek, zoned R2, and Newskah Creek zoned I2. Table 6-23 provides a summary of current land use, zoning and SEDs.

Table 6-23 South Grays Harbor Tributaries AU Shorelines Land Use, Zoning and Shoreline Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Andrews Creek	• Forestry........................ 89% • Vacant/Undeveloped .. 11%	• General Dev 5 .... 100%	• Not designated
Charley Creek	• Forestry........................ 60% • Vacant/Undeveloped .. 37% • Trades and Services..... 1%	• General Dev 5 .... 63% • Residential .... 21% • Industrial..................... 16%	• Not designated
Elk River	• Forestry........................ 65% • Vacant/Undeveloped .. 34%	• General Dev 5 .... 100%	• Conservancy
Johns River	• Forestry........................ 61% • Vacant/Undeveloped .. 18% • Agriculture................... 15% • CER .... 2% • Residential 2%	• General Dev 5 .... 100%	• Conservancy
Newskah Creek	• Forestry........................ 73% • Residential .... 11% • Vacant/Undeveloped .. 10% • Trades and Services..... 1%	• General Dev 5 .... 85% • Industrial..................... 15%	• Conservancy • Urban

Potential Future Land Use

The South Grays Harbor Tributaries AU's shorelines have little capacity for significant future development. Most of the vacant or undeveloped shoreline lands are located along the Elk and Johns Rivers (Approximately 403 acres combined) and are zoned G5, which allows only low density development. Both Charley Creek and Newskah Creek have undeveloped lands along the Harbor that are currently zoned for industrial uses (36 and 14 acres respectively). There are also approximately 9 acres of vacant land zoned R2 along Charley Creek, that could accommodate some very modest residential development. These areas of the shoreline are most likely to experience development, although as noted above, development will likely be slow. The acreage and current zoning of those lands are shown for each waterbody in Figure 6-11.

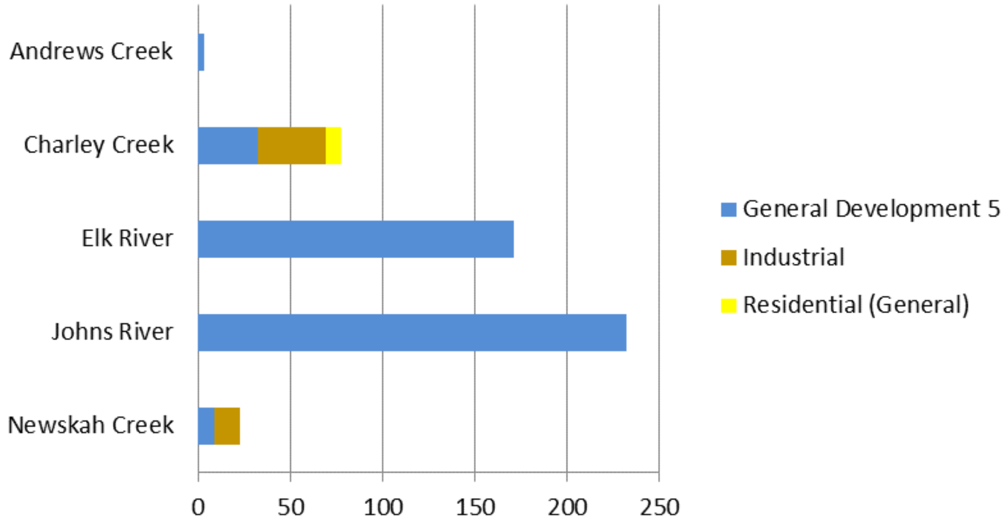


Figure 6-11. South Grays Harbor Tributaries AU Zoning of Vacant and Undeveloped Shoreline Uplands
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Water-Oriented Uses

Agricultural uses (192 acres) and public access sites are considered water-oriented. Water-dependent uses include a recreational boat launch at the end of the Johns River. Utility outfalls and intakes are also considered water-dependent uses. Water-related uses may include the Westport fisheries facility and the Ocean Spray cranberry facility in Markham. There is also a seafood processor, Coast Seafood Co. located along Johns Creek. Water enjoyment uses include parks and open space, a boat launch, and trails. See Public Access below.

Shoreline Permit History

Within the South Grays Harbor Tributaries AU, 18 shoreline permits have been issued since 1972. Approximately 17 were SDPs and the other one was of an unknown type. Only one permit has been issued since 2000. It was issued for development of a live inshore hagfish processing and shipping/export operation within portions of the old Associated Seafood Company facilities in Markham.

Transportation

Generally, there is little road and transportation infrastructure development within shoreline jurisdiction of the South Grays Harbor AU. There are no roads within Elk River shorelines. There are approximately three bridges within shoreline jurisdiction. Major and minor roads are listed below.

Major Roads:

- SR 105 crosses Johns River at the mouth of the river where it meets Grays Harbor (Johns River – 1). It also crosses Newskah Creek downstream near Aberdeen and Grays Harbor (Newskah Creek – 2). The Eastside Johns River Bridge crosses the Johns River near the mouth of the river (Johns River – 1).

Minor Roads:

- The majority of Newskah Road is within shoreline jurisdiction of Newskah Creek. A large stretch of Johns River Road is within shoreline jurisdiction in the upstream reaches of the Johns River (Johns River – 3).

Public Access

Identified public access sites in the AU are listed below.

- WDFW Johns River Wildlife Area:
  - The Johns River Unit is 1,500 acres located 10 miles south of Aberdeen. It includes a boat launch and opportunities for hiking, wildlife watching, and fishing.
  - There is also a DNR-owned boat launch on Johns River.
- DNR Elk River Natural Resources Conservation Area (NRCA) (5,413 acres) is the largest, highest quality estuarine system remaining in Washington or Oregon. It is a 5,413 acre area of high quality estuarine systems that lie in the Pacific flyway. Public access appears to be limited. Researchers may propose a research project at the site.

Identified conservation easements and protected lands include O'Leary Creek (Forterra).

Historic and Archeological Sites

There are no historic sites identified in the DAHP's list of Washington State or National Register of Historic Places. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.13 Pacific Coast

Summary

The Pacific Coast AU encompasses the County's Pacific Ocean coastline and is divided into 10 shoreline analysis reaches. Table 6-24 provides further details on each waterbody's characteristics.

Table 6-24. Summary Characteristics of Pacific Coast AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Pacific Coast	1249	1271	• Conservancy....4% • County ....<1% • Federal ....3% • Private ....36% • State – Other ....1% • State - State Parks ....2% • State – WSDOT....<1% • QIN ....27% • Unknown....<1% (73%)

Current and Future Land Use

Current Land Use

According to County Assessor data, the most prevalent current shoreline use category in the Pacific Coast AU is vacant/undeveloped lands, which comprise 384 of the AU's 1,249 acres (31%). There are also 265 (21%) acres classified as unknown, which are lands within the QIR. Forestry is a much smaller land use element that in other areas of the County (5%). Residential (12%) land uses are concentrated around the coastal communities of Moclips, Sunset Beach, Highland Heights, Pacific Beach, Ocean Grove, Iron Springs, Copalis Beach, Ocean City, Cohassett Beach, and Grayland. The limited commercial use (<1%) is generally located in the same areas.

The Pacific Coast AU has a relatively large amount of shoreline areas in recreational land use (51 acres – 4%). Recreational land use is dispersed along the entire length of the Pacific Coast within Grays Harbor County jurisdiction and generally occurs near developed areas and communities.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

This Pacific Coast AU is primarily designated Recreational-Residential on the County's Comprehensive Land Use Map. The County's zoning implements this designation. Most of the Coast, outside of the QIR is zoned R3 with smaller amounts of R2 and G5. The R3 – Resort Residential – is applied to allow and encourage recreational and standard residential development at relatively high density (1du/7,200 square feet). Table 6-25 provides a summary of current land use, zoning and SEDs.

Table 6-25. Pacific Coast AU Shorelines Land Use, Zoning, and Current Shoreline Environment Designation by Waterbody
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Pacific Coast	• Vacant/Undeveloped .. 31% • Unknown .... 21% • Residential .... 12% • Forestry .... 5% • CER .... 4% • Trades and Services .. <1% • TCU .... <1%	• Not Zoned .... 61% • Residential 1 (Resort) . 34% • Residential .... 2% • General Dev 5 .... 3%	• Ocean Beach Conservancy

Potential Future Land Use

The Pacific Coast AU's shorelines represent the area with the highest likelihood of future development. Both the tourist and vacation home markets are located here. Because people visiting the coast typically travel from outside the County, development along the coast is influenced more by statewide economic trends rather than County trends. The location of vacant lands may be a stronger indication of development demand in this AU than others. The acreage and current zoning of those lands are shown in Figure 6-12. As shown, there is not a substantial amount of development capacity within the AU. There are roughly 384 acres of lands classified as vacant or undeveloped. Of those, 53% are located in north part of the County within the QIR. Approximately 42% (156 acres) are located in the southern reaches are zoned for residential development (RR).

It is, however, important to note that the Pacific Ocean beach in the County is very wide. Most of the beach fronting structures are outside shoreline jurisdiction. This will likely be true for new development as well.

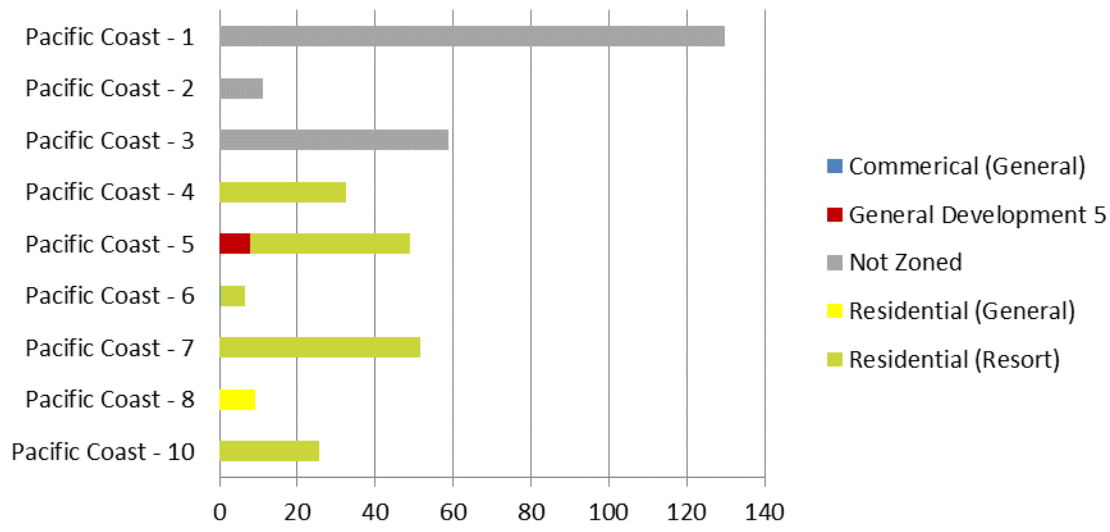


Figure 6-12. Pacific Coast AU Zoning of Vacant and Undeveloped Shorelines by Reach
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Water-Oriented Uses

As noted above, most of the upland land uses along the Pacific Coast have structures located outside of shoreline jurisdiction. Commercial aquaculture is a water-dependent use. The DOH has classified most of the Pacific Coast as an approved commercial shellfish growing area. Recreational shellfishing is also a water-oriented use and is common on the coast.

Razor clam digging is a popular seasonal activity that is regulated by WDFW. Several digs are allowed each year along coastal beaches, including Mocrocks Beach, which extends from the Copalis River to the southern boundary of the QIR near the Moclips River, and Copalis Beach, which extends from the Grays Harbor north jetty to the Copalis River. Recreational salmon fishing areas extend along the coast north of Ocean Shores and south of Westport.

Water-oriented uses also include a variety of tourism-related uses. Tourism is a large sector of the County's economy. Tourism opportunities are especially abundant in the Pacific Coast AU, where charter fishing and ocean beaches attract visitors. While tourists come to ocean beaches throughout the year, the summer months are a peak time.

Water-dependent uses would include utility outfalls and intakes. Water-related and enjoyment uses include recreational uses as well as the parks and public access sites listed below.

Shoreline Permit History

Within the Pacific Coast AU, 173 shoreline permits have been issued since 1972. Of those 109 were SDP, 25 were CUP, and 39 are of an unknown type. Approximately 41 permits have been issued since 2000. The majority of these were for subdivisions, grading and filling, and utility projects related to residential development.

Transportation

Generally, there are few roads and little transportation infrastructure development within shoreline jurisdiction of the Pacific Coast AU. Transportation facilities are listed below.

Major Roads:

- SR 109 is within shoreline jurisdiction near Wreck Creek (Pacific Coast – 3), the mouth of the Moclips River (Pacific Coast – 4), south of Joe Creek 2 (Pacific Coast – 5), and Boone Creek (Pacific Coast – 5).

Minor Roads

- There are a few minor roads within shoreline jurisdiction. These are concentrated in coastal settlements near the mouths of rivers and creeks.

Other:

- Copalis Beach Airport is adjacent to the Olympic Coast National Marine Sanctuary near the mouth of the Copalis River and located directly on the beach (Pacific Coast – 6).

Public Access

Beaches in the northern coastal sections are owned by the QIR, and access is prohibited for non-tribal members unless they have explicit permission from the QIN or are accompanied by a tribal member. The Pacific Coast beaches south of the QIR are publically accessible.

Other access sites are listed below.

Northern Pacific Coast (Reaches 1-7):

- Tunnel Island (QIR)
- North Raft River, South Raft River, Raft River (QIR)
- Hogsback and Little Hogsback
- North and South Cape Elizabeth
- Taholah, Quinault River Mouth
- Taholah, North Point Grenville
- Point Grenville, Point Grenville Islands, and Grenville Bay
- Grays Harbor Audubon Society, Raft River
- Dr. Edward Lycan County Park

- Pacific Beach State Park (6.4 acres)
- Griffith-Priday Ocean State Park (54 acres)
- Ocean City State Park (20 acres)
- Sunset Beach at Beach Lane and 2nd Street provide beach access to the Seashore Conservation Area.
- Moclips Pacific Beach near Highland Heights
- Roosevelt Beach Access south of Ocean Grove provide sandy public beach and access to the Seashore Conservation area.
- Iron Springs Park
- Copalis Beach is just south of the Griffith-Friday Ocean State Park near Copalis. It provides access to the Seashore Conservation Area.
- Ocean City Beach Access
- Sampson Beach provides public access to the Seashore Conservation Area with scenic boardwalk through sand dune ecosystem. It is located just north of Ocean City State Park.
- Oyhut and Illahee Beach North

Southern Pacific Coast (Reaches 8-10):

- Twin Harbors Beach State Park (16.6 acres)
- Grayland Beach and Beach Access
- Westport Beaches

Historic and Archeological Sites

There are 26 historic sites listed in the DAHP inventory of State or National Register of Historic Places in or near shoreline jurisdiction. Most of the sites are associated with the former military site near Pacific Beach. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

6.2.14 Grays Harbor Estuary

Summary

The Grays Harbor AU encompasses the harbor shorelines in unincorporated Grays Harbor County. Table 6-6-26 provides further details on each waterbody's characteristics.

Table 6-26. Summary Characteristics of Grays Harbor AU
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Area of Upland Shoreline Jurisdiction (acres)	No. of Parcels Wholly or Partially in Shoreline Jurisdiction	Shoreline Jurisdiction Ownership Profile (shoreline area with ownership data)
Grays Harbor	4,127	970	• City ....<1% • Conservancy.................13% • County ....1% • Federal ....<1% • Port of Grays Harbor ....<1% • Private ....43% • Railroad ....1% • State – DNR ....23% • State – Others ....3% • State - State Parks ....1% • State – WDFW................5% • State – WSDOT..............2% (91%)

Current and Future Land Use

Current Land Use

Current shoreline land use in Grays Harbor Estuary AU is primarily classified as undeveloped lands (48%) or forestry (22%), according to County Assessor data. Concentrations of undeveloped areas occur along the northern and southern shorelines of Grays Harbor. Residential uses are concentrated around the unincorporated areas of Oyehu and Gray Gables on the northern shore, and Bay City, Laidlow, Cohassett Beach, Cohassett on the southern shore, and along the southern shoreline between Bay City and Aberdeen along Highway 105. Manufacturing uses (2 acres) are located on the southern shore of Grays Harbor near the mouth of Newskah Creek. A concentration of recreational land use is located near the town of Laidlow. Aquacultural uses of the harbor occur primarily waterward of the OHWM and are described in more detail under Water-oriented Uses.

Comprehensive Land Use Plan, Zoning and Shoreline Designations

The Grays Harbor Estuary AU carries several Comprehensive Land Use Map designations. The areas along the coast north of Ocean Shores and South of Westport are designated Recreational-Residential. The areas at the downstream end of the Humptulips River is designated Agricultural and the southern side of the harbor is designated Urbanizing. The County's zoning is not consistent with all of the land use designations.

Most of the harbor's shorelines are zoned G5. The area west of the Humptulips River is zoned A1. Smaller areas south of Aberdeen are zoned I2 and R2. Table 6-27 provides a summary of current land use, zoning and current SEDs.

Table 6-27. Grays Harbor Estuary AU Shorelines Land Use, Zoning, and Current Shoreline Environment Designation
(Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Jurisdictional Waterbody	Existing Land Use	County Zoning	Current Shoreline Environment Designation
Grays Harbor	• Vacant/Undeveloped ....51% • Forestry ....23% • Residential ....9% • CER ....4% • Manufacturing/Industrial .2% • Agriculture ....<1% • Fishing ....<1% • Trades and Services ....<1% • TCU ....<1% • Water ....<1%	• General Dev 5 ....84% • Residential 1 (Resort) ..7% • Industrial ....5% • Agricultural 4%	• Conservancy • Natural • Rural • Urban

Potential Future Land Use

The Grays Harbor Estuary AU's shorelines have limited capacity for development along Grays Harbor. There is a large amount of vacant and undeveloped land (1,842 acres), but most of it (87%) is zoned for low density development G5. Areas zoned for industrial and residential uses that are close to urbanized areas would be most likely to develop (Grays Harbor – 9). The acreage and current zoning of vacant and undeveloped shoreline areas are shown for each shoreline reach in Figure 6-13.

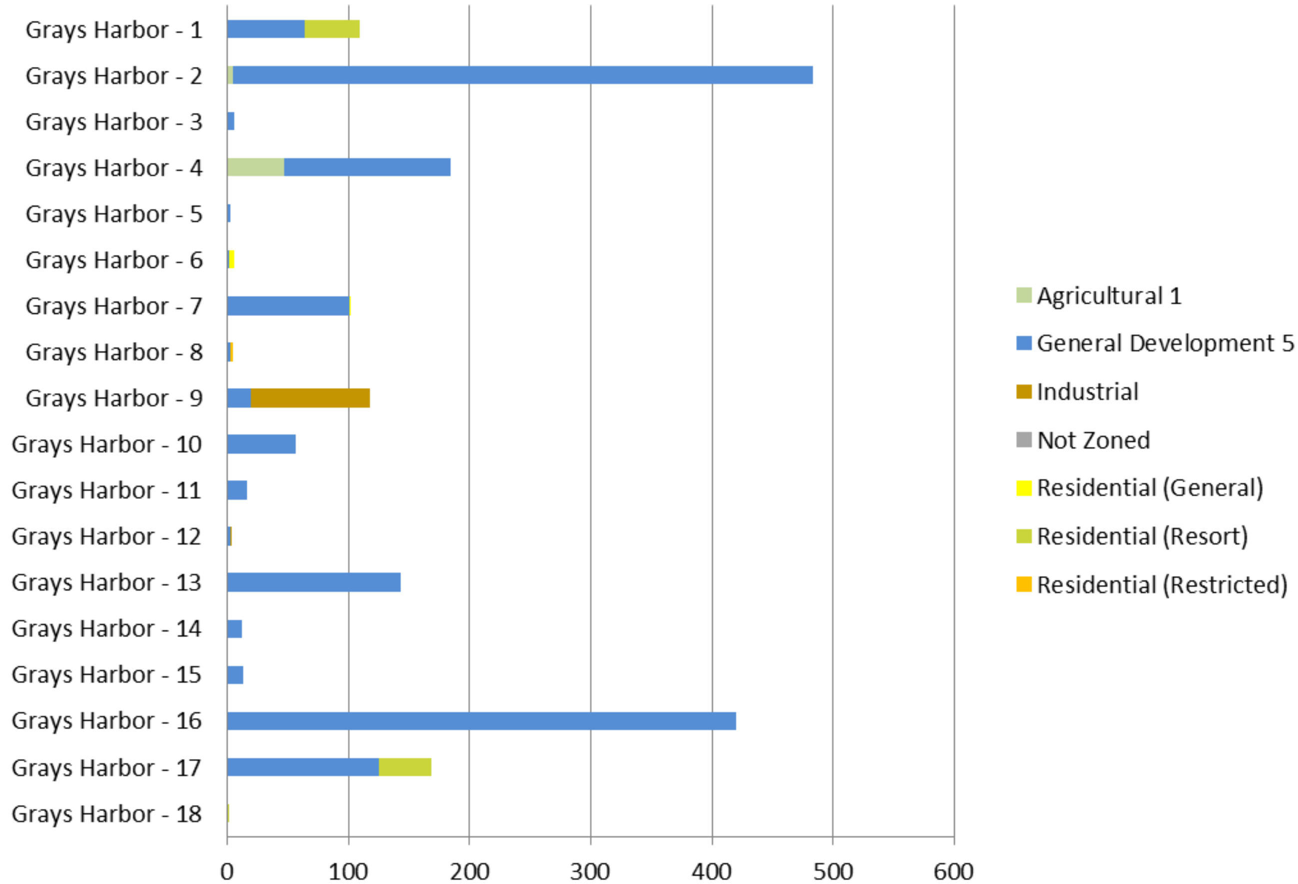


Figure 6-13. Grays Harbor Estuary AU Zoning of Vacant and Undeveloped Shorelines by Reach (Source: Grays Harbor County, 2013; TWC, 213, BERK, 2013)

Water-Oriented Uses

Water-dependent uses in Grays Harbor include aquaculture. DNR and Grays Harbor County have designated between approximately 6,600 and 8,000 acres of tidelands within Grays Harbor as Oyster Tracts or Oyster Lots. These tidelands have been classified by the County as resource lands of long term commercial significance under 84.34 RCW. The County does not keep records of the types of aquacultural activities that occur on these tracts. The tracts are concentrated in four locations: three generally north of the navigation channel and one south (Figure 6-14).

The DOH licenses and regulates companies that commercially harvest and sell shellfish. DOH tracks levels of pollutants and closes areas to shellfish production where levels are too high. All areas of the State where commercial harvesters obtain a license must be approved by DOH. Grays Harbor west of the Chehalis River, excluding the shoreline east of the City of Westport, has been approved for commercial shellfish growing. Shellfish growing within the Chehalis

River is prohibited because of water quality concerns. There are 8 companies licensed to commercially grow shellfish in Grays Harbor as of the most recent list of licensed shellfish companies (DOH 2014).

A report submitted by the Washington Shellfish Growers, as part of a 2007 Corps Nationwide Permit 48 (Existing Commercial Shellfish Aquaculture Activities) application, documented the general location, size and type of shellfish culture areas within Grays Harbor (B. Hudson, personal communication, August 1, 2014). As shown in Figure 6-14, shellfish aquaculture areas are located in four general areas within Grays Harbor: Northwest, North Central, Northeast and South.

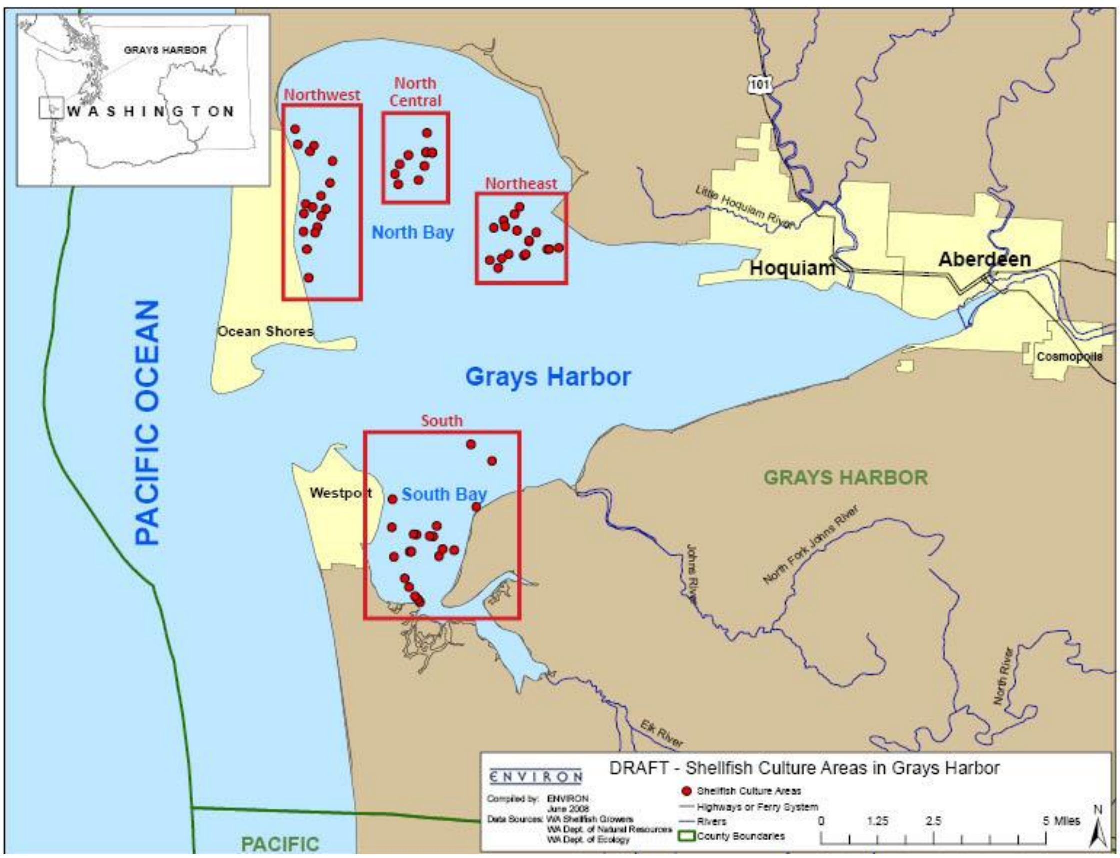


Figure 6-14. Shellfish growing areas in Grays Harbor.
(Source: B. Hudson, personal communication, August 1, 2014; BERK, 2014)

The 2008 report further identified the general sizes of the shellfish culture areas and the types of shellfish being harvested. There were 52 culture areas documented. Most (38) were growing both oysters and clams and most (49) were 10 to 100 acres in size. Table 6-28 summarizes the location, type and size of aquaculture area from those data:

Table 6-28. Grays Harbor Shellfish Aquaculture Locations, Type, and Size
(Source: B. Hudson, personal communication, August 1, 2014; BERK, 2014)

Area	Number, Size and Type of Shellfish Culture Areas		
	Oysters only	Oysters/Clams	Oysters/Clams/Mussels
Northwest		• 10-100 acres.............. 14 • >100 acres.................... 3	
North Central	• 10-100 acres................. 2	• 10-100 acres................ 6 • >100 acres.................... 1	
Northeast	• 10-100 acres................. 2	• 10-100 acres.............. 14 • >100 acres.................... 1	
South	• 10-100 acres................. 7 • >100 acres.................... 1	• 1-10 acres..................... 5 • 10-100 acres................ 4 • >100 acres.................... 1	• 1 – 10 acres.................. 2

Water-oriented uses also include a variety of tourism related uses. Tourism related activities in Grays Harbor are typically associated with activities including fishing, boating, shellfishing, and birdwatching. Recreational shellfish beaches are located in both the North and South Bays. The South Bay has a large stretch of recreational shellfish beaches along shorelines west of the mouth of the Johns River and around the mouth of the Elk River.

Utility outfalls are also considered water-dependent. Water enjoyment uses include parks and open space detailed below in Existing and Potential Public Access.

Shoreline Permit History

Within the Grays Harbor Estuary AU, 82 shoreline permits have been issued since 1972. Of those 64 were SDP, four were CUP, and 14 are of an unknown type. Approximately 14 permits have been issued since 2000.

Transportation and Utilities

Northern shoreline reaches (GH – 1 through GH – 8)

Generally, there is little road and transportation infrastructure development in the northern shoreline jurisdiction of Grays Harbor Estuary AU (reaches 1 through 8). There are approximately 4 bridges in shoreline jurisdiction in reaches 1-8. Major and minor roads in the northern shoreline reaches are listed below.

Major roads:

- SR 109 is within shoreline jurisdiction where it crosses Grass Creek (Grays Harbor – 7) and outside Hoquiam (Grays Harbor – 9).

Minor roads:

- A few residential access roads are within shoreline areas near Campbell Slough, Grass Creek and near Hoquiam.
- There are approximately 3 bridges within shoreline jurisdiction.

Southern shoreline reaches (GH – 9 through GH – 18)
Generally, the southern shorelines of Grays Harbor (reaches 9 through 18) have little road development or transportation infrastructure within shoreline jurisdiction. Roads within shoreline jurisdiction are concentrated near Aberdeen, Westport, Markham, and Bay City. Reaches 16 and 17 are particularly undeveloped. There is 1 bridge within shoreline jurisdiction. Major and minor roads in the southern shoreline reaches are listed below.

Major roads:

- SR 105 is within shoreline jurisdiction near Aberdeen (Reach 9). It crosses Grays Harbor connecting Bay City to Westport (Grays Harbor – 14, 15, 17).

Minor roads

- A few residential access roads are within shoreline areas northeast of Markham (Grays Harbor – 13, 14, 15).
- Approximately 1.5 miles of Bay View Road is within shoreline jurisdiction (Grays Harbor – 14). There are a few residential access roads within shoreline jurisdiction south of Westport.

Public Access

Documented public access sites are listed below.

North Bay (Reaches 1-8, and Reach 19):

- Damon Point State Park - 61-acre day-use park, is the southeastern tip of the Ocean Shores Peninsula (Grays Harbor-19). The park consists of a one-mile-long, half-mile-wide stretch of land extending into Grays Harbor. The Park is accessible by car and boat.
- DNR: Goose Island Natural Area Preserve (NAP) supports a large colony of nesting seabirds.
- DNR: North Bay NAP contains one of the highest quality coastal freshwater and sphagnum bog systems in WA State.
- DNR: Sand Island NAP protects nesting seabird colonies

- Unnamed public beach BIDN 990014 near State highway 109 and the confluence of Grass Creek.
- Unnamed public beach with boat access only near Point New in Grays Harbor – 7.
- North Bay Bog contains 91 acres of undisturbed sphagnum bog on the north shores of Grays Harbor. It is privately owned by Forterra but has known public access.

South Bay (Reaches 9-18):

- DNR: The 5,416-acre Elk River NRCA occupies Reach 16 of the Greys Harbor AU, along with parts of the South Grays Harbor Tributaries AU.
- WDFW Johns River Wildlife Area has several units within shoreline areas of the Grays Harbor Estuary AU. The units provide recreation associated with fish and wildlife or for species and habitat protection.
- The Elk River Unit is located on the southern coast of Grays Harbor, about 3 miles south of Westport. With its focus on the estuary, tide flat and salt marsh restoration, this unit provides opportunities for bird watching, hunting and wildlife viewing.
- Humptulips-Grass Creek Unit (890 acres) is located in the North Bay of Grays Harbor at the confluence of the Humptulips River, Grass Creek and Grays Harbor. There are no maintained trails and it is best accessed by boat. It has excellent bird watching opportunities.
- WDFW Johns River Wildlife Area: The Johns River Unit is 1,500 acres located 10 miles south of Aberdeen. It includes a boat launch and opportunities for hiking, wildlife watching, and fishing.
- Ocosta Recreation Center
- Bottle Beach State Park (40.6 acres) provides a long stretch of public beach on Grays Harbor and a scenic estuary area with extensive upland board walks and trails.
- DNR: Whitcomb Flats NAP supports nesting seabird colonies.
- Unnamed beach BIDN-990019 (government tidelands with known public access in Grays Harbor – 14).

Identified conservation easements and protected lands are listed below.

- Grays Harbor Audubon, Humptulips, Chenois Creek (privately owned land with known public access). The Audubon's North Bay Wetlands Preserve conserves wetlands along the north shore of Grays Harbor and in and around the Humptulips River and estuary.
- North Bay Bog (Forterra)
- North Shore Grays Harbor (Forterra)
- Stafford Creek (Forterra)

- Three Creeks (Forterra)
- Grays Harbor Bluff (Forterra)
- Coastal Natural Area Preserve (WA Wildlife and Recreation Coalition)

Historic and Archeological Sites

There is one historic site listed in the DAHP inventory of State or National Register of Historic Places in or near shoreline jurisdiction. The site, located in Grays Harbor-18, is not identified by name. Based on the historic use of this area by native peoples, there is the likelihood that archeological and cultural resources exist even if not mapped by the sources used in this analysis.

7 SHORELINE MANAGEMENT RECOMMENDATIONS

The following are recommended actions for translating inventory and characterization findings into the draft SMP policies, regulations, environment designations, and restoration strategies for areas within shoreline jurisdiction. In addition to the following analysis-specific recommendations, the updated SMP will incorporate all other requirements of the Shoreline Management Act (RCW 90.58) and the Shoreline Master Program Guidelines (WAC 173-26).

7.1 Environment Designations

7.1.1 Background

As outlined in WAC 173-26-191(1)(d), "Shoreline management must address a wide range of physical conditions and development settings along shoreline areas. Effective shoreline management requires that the shoreline master program prescribe different sets of environmental protection measures, allowable use provisions, and development standards for each of these shoreline segments." In WAC 173-26-211(2)(a), the Guidelines further direct development and assignment of environment designations based on "existing use pattern, the biological and physical character of the shoreline, and the goals and aspirations of the community as expressed through comprehensive plans…" (note: The methodology discussion in Section 7.1.2, below, describes how the function analysis scores presented in Section 5 may be considered in assigning preliminary designations).

The current SMP utilizes a system of five environment designations: Urban, Rural, Conservancy, Natural, and Ocean Beaches. Definitions and designation criteria for each are provided in Table 7.1, below. The shoreline environment designation map was originally developed in 1974, and thus the environment designation assignments may no longer provide the best fit with the existing biological and land use character or the community's vision as expressed in the latest Comprehensive Plan. Additionally, the Grays Harbor Estuary Management Plan (GHEMP) is used by the County to regulate shorelines on Grays Harbor and the lower Chehalis River. Eight management categories were included in the GHEMP: Urban Development (not located within unincorporated County areas), Urban Mixed, Urban Residential, Rural Low Density, Rural Agricultural, Conservancy Managed, Conservancy Natural, and Natural. The GHEMP addresses all aquatic areas within Grays Harbor under the Conservancy Managed management category. Definitions and designation criteria for each GHEMP management category are also provided in Table 7.1, below.

The Guidelines recommend use of six unique environments: Aquatic, Natural, Urban Conservancy, Rural Conservancy, Shoreline Residential, and High-Intensity. However, each jurisdiction may use alternate environment designations, as appropriate, as long as they provide equal or better protection than the standard. Table 7.1, below summarizes Ecology's suggested criteria for each of their designations, and shows the approximate correlation between the County's existing system and Ecology's system.

Table 7.1. Comparison of Existing and Ecology Shoreline Environment Designations

Existing County Designation, Purpose, and Criteria	GHEMP Designation, Purpose, and Criteria	Ecology's Designation, Purpose, and Criteria (WAC 173-26-211)	Comparison
Urban The Urban designation is intended for the most intensive human use of the shoreline. All forms of human development and activity which make use of shoreline areas are appropriate for the Urban Environment. Some other uses which typically locate near shorelines are also included. Specific criteria are not given. However, the current policies state that, "The Urban Environment should include water dependent industrial, commercial, and residential uses and should encourage maximum provisions of public access to shorelines compatible with the shoreline use."	**Urban Mixed** The Urban Mixed designation includes areas of mixed compatible urban uses where residential densities are higher than in rural areas.	**High Intensity** Purpose: "to provide for high-intensity water-oriented commercial, transportation, and industrial uses…" Criteria: "shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial 'rural areas of more intense development'…if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity water-oriented uses."	Compared to Ecology's High Intensity designation, the County's Urban designation includes a broader scope of uses (e.g. residential). The County could consider utilizing a separate residential designation for areas with more intense Single Family Residential (SFR) uses, similar to the approach used in the GHEMP with separate Urban Mixed and Urban Residential designations.
No comparable designation	**Urban Residential:** Urban Residential areas include areas of predominantly residential development.	**Shoreline Residential** Purpose: "…accommodate residential development and appurtenant structures that are consistent with this chapter…provide appropriate public access and recreational uses." Criteria: "inside urban growth areas, as defined in RCW 36.70A.110, incorporated	The Urban Residential designation from the GHEMP is comparable to Ecology's Shoreline Residential designation. A comparable designation is not included under the Grays Harbor SMP.

Existing County Designation, Purpose, and Criteria	GHEMP Designation, Purpose, and Criteria	Ecology's Designation, Purpose, and Criteria (WAC 173-26-211)	Comparison
		municipalities, "rural areas of more intense development," or "master planned resorts," as described in RCW 36.70A.360, if they are predominantly single-family or multifamily residential development or are planned and platted for residential."	
Rural The Rural designation is intended for most forms of human use or activity which are appropriate shoreline uses or typically located along shorelines but at a lower density than the Urban Environment. These areas will for the foreseeable future be served by septic tanks and soils limitations require a lower density of development. Lower density environments are a preferred life style for many and this environment provides them with the opportunity to locate near shorelines without adversely affecting the environment Specific criteria are not given. However, the current policies state that, "The Rural Environment should be employed in those	**Rural Low Intensity** The Rural Low Intensity designation restricts intensive development on undeveloped banks, to maintain open space and recreational uses. **Rural Agricultural** The Rural Agricultural designation is intended to protect agricultural lands from expanding urban and rural-low intensity development.	**Rural Conservancy** Purpose: "…to protect ecological functions, conserve existing natural resources and valuable historic and cultural areas in order to provide for sustained resource use…and provide recreational opportunities. Examples of uses that are appropriate…include low-impact outdoor recreation uses, timber harvesting on a sustained-yield basis, agricultural uses, aquaculture, low-intensity residential development and other natural resource-based low-intensity uses." Criteria: "if any of the following characteristics apply: …currently supporting lesser-intensity resource-based uses, such as agriculture, forestry, or recreational uses, or is	For the most part, Ecology's Rural Conservancy designation is very similar to the County's Rural designation and the GHEMP Rural Low Intensity designation. The Rural Agricultural designation would seem to be more closely related to a zoning overlay than to a shoreline environment designation. Therefore, a single Rural or Rural Conservancy designation would seem appropriate.

Existing County Designation, Purpose, and Criteria	GHEMP Designation, Purpose, and Criteria	Ecology's Designation, Purpose, and Criteria (WAC 173-26-211)	Comparison
areas where low density development is planned or presently exists. These areas are not planned for extensive roadway systems, or sanitary sewage systems. Soil limitations for septic tank disposal and the desire of residents to live with, rather than dominate, the environment support the lower density."		designated agricultural or forest lands…; …currently accommodating residential uses outside urban growth areas and incorporated cities or towns; …shoreline is supporting human uses but subject to environmental limitations, such as properties that include or are adjacent to steep banks, feeder bluffs, or flood plains or other flood-prone areas; …high recreational value or with unique historic or cultural resources; …shoreline has low-intensity water-dependent uses."	
Conservancy The Conservancy designation is intended to protect lands, wetlands, and water of economic, recreational, and natural value. Development for purposes which would be detrimental to resources capability and utilization is not permitted. Specific criteria are not given. However, the current policies state that, "The Conservancy Environment is intended to be used in areas where man is managing a natural resource but not establishing permanent	**Conservancy Managed** The Conservancy Managed designationn allows uses that depend on the natural system for production of food, recreation, research, or public access. **Conservancy Natural** Conservancy Natural areas shall maintain the general natural character of areas with minimum direct human influence.	**Rural Conservancy** Purpose and criteria outlined above.	The intent of the County's Conservancy and the GHEMP Conservancy Managed designations is to protect resource-based uses of shorelines. Ecology's Rural Conservancy designation includes a broader range of uses. The Conservancy Natural designation in the GHEMP restricts most uses and developments to protect the natural character of the shoreline. This designation combines elements of Ecology's

Existing County Designation, Purpose, and Criteria	GHEMP Designation, Purpose, and Criteria	Ecology's Designation, Purpose, and Criteria (WAC 173-26-211)	Comparison
development and high intensity uses. This includes all prime agricultural land, forest lands, aquacultural areas."			Rural Conservancy and Natural designations (see description below). The County should review the GHEMP designation maps to determine whether shorelines with the Conservancy Natural designation can be divided into Rural Conservancy and Natural designations, or if the Conservancy Natural designation provides necessary flexibility in management.
Natural The Natural designation is intended for those areas which have extreme importance for the maintenance of natural systems, and in which any include change in the land, vegetation, or water would have significant adverse impact on the system. Specific criteria are not given. However, the current policies state that, "The Natural Environment is intended to protect those areas which cannot withstand any substantial invasion by man and which are of particular value, either as essential parts of natural systems, or which have some service, cultural, historical,	**Natural** The Natural management designation preserves and restores natural areas to their natural condition, relatively free from human influence.	**Natural** Purpose: "…to protect those shoreline areas that are relatively free of human influence or that include intact or minimally degraded shoreline functions intolerant of human use. These systems require that only very low intensity uses be allowed..." Criteria: "…if any of the following characteristics apply: …shoreline is ecologically intact and therefore currently performing an important, irreplaceable function or ecosystem-wide process that would be damaged by human activity; …considered to represent ecosystems and geologic types that are of particular scientific and	The County, GHEMP, and Ecology's Natural designations are extremely similar.

Existing County Designation, Purpose, and Criteria	GHEMP Designation, Purpose, and Criteria	Ecology's Designation, Purpose, and Criteria (WAC 173-26-211)	Comparison
education, archeological or scientific value. Natural or societal value or fragility characterize these areas"		educational interest; …unable to support new development or uses without significant adverse impacts to ecological functions or risk to human safety."	
Ocean Beach The Ocean Beach designation is intended to preserve the natural systems and amenities while providing for development of accommodations and services related to and necessary for support of human use of the beach areas Specific criteria are not given. However, the current policies state that, "The Ocean Beach Environment is intended to apply to the beach, dune and upland areas associated with the Pacific Ocean. The environment is intended to preserve the natural systems and amenities which attract people to the area while providing for development of accommodations and services related to and necessary for support of human use of the beach areas."	No comparable designation	**Natural or Rural Conservancy** See above criteria	The County's Ocean Beach environment is unique and may be continued in the future as it clearly promotes the protection of natural systems while also acknowledging the important economic benefit that the ocean environment provides to the County. However, there are other environment designations or combinations thereof which could similarly apply. This could include parallel designations which might account for both Natural or Rural Conservancy areas and adjoining more intensive development.
No comparable designation	**Management Unit 44**	**Aquatic**	The County will need to include an Aquatic designation for areas

Existing County Designation, Purpose, and Criteria	GHEMP Designation, Purpose, and Criteria	Ecology's Designation, Purpose, and Criteria (WAC 173-26-211)	Comparison
	Management Unit 44 in the GHEMP addresses the water area of Grays Harbor. The area is to be managed for its natural resources, while balancing allowed uses and activities.	Purpose: "…to protect, restore, and manage the unique characteristics and resources of the areas waterward of the ordinary high-water mark." Criteria: "…lands waterward of the ordinary high-water mark…may assign…to wetlands."	below the OHWM (including freshwater waterbodies). The County may consider multiple designations under the Aquatic environment to account for specific areas important for conservation or aquatic uses.

7.1.2 Methodology

There is substantial flexibility in the development of environment designation recommendations; however, the approach and rationale should be clearly documented. In general, the environment designation purpose and criteria will be utilized and further informed by the findings of this *Shoreline Analysis Report*, including the GIS data listed below.

- Current land use
- Planned land use
- Ownership
- Wetlands
- Floodplains
- Vegetation
- Impervious surface
- Ecological function scores (provided in Chapter 5 of this *Shoreline Analysis Report*)

While current and future land use provide the basic context for a given segment of land, recommended environment designations will not always correlate strongly with those parameters, particularly on currently undeveloped shoreline areas and shoreline areas with extensive critical areas (e.g., wetlands, floodways, channel migration zones, other geologically hazardous areas). This may also be the case where parcels are large, and extend well beyond shoreline jurisdiction. For example, while the current land use code may indicate a single-family residential use, the actual development may not be in shoreline jurisdiction and a more conservative designation could be appropriate to correspond with existing conditions in shoreline jurisdiction.

In some cases, vegetation (including identification of wetlands) and impervious surface data, as well as the ecological function results, may provide better gauges of the existing alteration level in shoreline jurisdiction. For this reason, parcels that have a current or planned land use of residential (or other designation allowing alteration) may ultimately have a Conservancy, or even Natural environment shoreline designation if the function score is high and examination of aerial photos and specific data layers provides additional support. In these cases, the parcels can still accommodate the existing or planned uses, perhaps even in shoreline jurisdiction, and satisfy the WAC requirements for consistency between the environment designations and the Comprehensive Plans (see WAC 173-26-211(3) for additional detail about consistency requirements).

In more developed areas, current land use will be more strongly correlated with level of alteration and the resulting environment designation. In these areas, often the entire parcel or a large portion of the parcel is in shoreline jurisdiction, and the allowed level of development may already have occurred.

7.1.3 Recommendations

Based on the Background and Methodology outlined above, the following specific recommendations are provided for development and assignment of environment designations in the County:

- The County updated its critical areas regulations and buffers for Type S waterbodies in 2012. For this reason, it is anticipated that the County will consider utilizing this buffer scheme for shoreline areas throughout the SMP. In such a case, the County should consider appropriate language to allow for water-dependent uses adjacent to shore.
- An Aquatic environment designation should be added to distinguish areas waterward of the OHWM. This may include more than one type of Aquatic designation to offer different provisions as needed to protect various uses (e.g. aquaculture) or important habitat.
- The existing environments should be updated with clear designation criteria along with regulations and policies that incorporate clear applicability and comply with State standards, even if unique designations are utilized.
- Similar to the current Ocean Beach environment, consider whether additional environment designations would be appropriate to further delineate unique areas that might warrant designation-specific use or modification regulations. As mentioned above, these might include multiple aquatic designations to address areas of significant aquaculture or other protection zones or residential focused designations to account for areas of more intense rural residential development.
- Substantively utilize inventory and characterization findings, such as GIS information and/or function scores, in this report to inform assignment of environment designations, as outlined in Methodology.

7.2 General Policies and Regulations

Archaeological and Historic Resources

- The findings of this Shoreline Analysis Report do not suggest a need for additional regulations beyond those mandated by the SMP Guidelines.

Critical Areas

- Consider whether the County's critical areas regulations should be incorporated into the SMP by reference or through direct inclusion. Either method of inclusion will likely require some modification of the County's critical areas regulations to meet SMA criteria. For example, any exceptions, such as reasonable use, will need to be removed as the appropriate SMA process for such action is through the Shoreline Variance process.
- The County's critical areas ordinance was updated in 2012, consistent with the GMA and best available science. As such, standard critical area buffers for streams and wetlands likely meet State standards. However, the critical areas regulations, including any incorporated shoreline buffers, will also need to be revisited to assess if changes are needed to recognize existing shoreline conditions and to accommodate water-oriented and other preferred uses consistent with no net loss of ecological functions [While the County's existing stream buffers are not environment-designation based, they do acknowledge the need to allow for water-dependent and water –enjoyment uses of shorelines].

Flood Hazard Reduction

- Levee systems are present in Grays Harbor County, but primarily are only mapped within incorporated municipalities. However, numerous levees associated with agricultural and past and present floodplain mining operations are present along County rivers, especially along the Chehalis River, and are critical protection elements for existing development and agriculture uses. Dikes are similarly present throughout the County's low lying areas. Consistent with the WAC provisions in the Guidelines, the SMP should provide maximum flexibility for developing and maintaining flood hazard reduction measures as needed to continue protection of existing uses while also emphasizing the maintenance of existing ecological functions.
- The existing SMP section on Shoreline Works and Structures, which currently covers a wide variety of shoreline stabilization methods, is too broad to address the specific requirements of flood control structures. Flood hazard reduction regulations, should be separated from other shoreline stabilization regulations.

Public Access

- Provide policies and regulations that recognize and facilitate implementation of existing parks, recreation, and open space plans and the Seashore Conservation Act.

- Provide public access, as feasible, in new commercial, industrial and multi-family development as well as publicly sponsored or financed utility and flood control facilities.
- Promote visual access where physical access is not feasible.

Shoreline Vegetation Conservation

- Build on the existing protections provided in the County's critical areas regulations and current SMP and the GHEMP, paying special attention to measures that will promote retention of shoreline vegetation and development of a well-functioning shoreline that does not impair physical and habitat-forming processes.
- Ensure that vegetation provisions allow for appropriate modifications to accommodate preferred uses, particularly water-oriented uses and public access.
- Include clear standards for fill, grading, and excavation by environment designation ensuring compliance with WAC requirements.
- Ensure that vegetation standards are clear regarding thinning, trimming and pruning of vegetation to maintain views and to minimize safety hazards.

Water Quality, Stormwater, and Nonpoint Pollution

- Consider incorporating regulations to facilitate maximum implementation of TMDL plans and controlling actions that would exacerbate impaired conditions in 303(d)-listed waterbodies for which TMDLs have not yet been prepared.
- Consider adding clarifying statements noting that while the SMP regulations apply only within shoreline jurisdiction, the policies of the SMP are also policies of the County's comprehensive plan and therefore they also apply to activities outside shoreline jurisdiction that affect water quality within shoreline jurisdiction.
- Consider special emphasis on controlling runoff adjacent to and upland of aquaculture facilities.

7.3 Shoreline Modification Provisions

Shoreline Stabilization

- Consider developing provisional sections that address bulkheads, riprap, revetments and other shoreline armoring structures, separate from other regulations which pertain to structures intended to attenuate open water waves and currents such as breakwaters, jetties, groins and weirs.

- Ensure “replacement” and “repair” definitions and standards are consistent with WAC 173-26-231(3)(a). Repair activities should be defined to include a replacement threshold so that applicants and staff will know when “replacement” requirements need to be met.
- Reference appropriate exemptions found in the WAC related to “normal maintenance and repair” and “construction of the normal bulkhead common to single-family residences.” These are not exemptions from the regulations, however; they are exemptions only from a Shoreline Substantial Development Permit.
- Give preference to those types of shoreline modifications that have a lesser impact on ecological functions. Policies and regulations should promote "soft" over "hard" shoreline modification measures.
- Consider requiring a Conditional Use Permit for any new hard shoreline stabilization.
- Incentives should be included in the SMP that would encourage modification of existing armoring, where feasible, to improve habitat while still maintaining any necessary site use and protection.

Piers and Docks

- Develop detailed dimensional and material standards for new piers/docks and replacement or modified piers/docks, including length, width, area, and pile size and location. Typically, these standards would apply to residential uses. For other types of uses, such as commercial, industrial, and recreational, it may not be appropriate to have such defined numerical standards but rather standards for these uses should rely on mitigation sequencing to develop an appropriate design.
- Consider customizing these standards separately for marine/estuarine, riverine and lacustrine environments. If this is separate standards are established, define how the break between estuarine and riverine environments will be determined.
- Be consistent, to the extent practicable based on local conditions and requirements for no net loss, with WDFW and Corps design standards, and recognize special local issues or circumstances, including presence of federally listed fish.
- As with the current SMP, continue to place emphasis on joint-use or community piers and docks over single-use structures.
- Similar to the recommendation under Shoreline Stabilization, ensure repair activities are defined to include a replacement threshold so that applicants and staff will know when “replacement” requirements need to be met.

Fill

- Restoration fills should be encouraged, including improvements to shoreline habitats, material to anchor LWD placements, and as needed to implement shoreline restoration.
- Fills waterward of the OHWM to create developable land should be prohibited, and should only be allowed landward of OHWM if not inconsistent with the requirement to protect shoreline ecological functions and ecosystem-wide processes.
- Add "Excavation" to section title for reader clarity and include appropriate provisions which address excavation. Note that excavation below the OHWM is considered dredging.

Breakwaters, Jetties, Groins and Weirs

- Consider prohibiting new breakwaters, jetties, groins, or weirs in the SMP except where they are essential to restoration or maintenance of existing water-dependent uses.

Beach and Dunes Management

- Recognize that some interdunal wetlands may be hydrologically associated with the shoreline and therefore be considered as shoreline jurisdictional wetlands, even when they are well beyond 200 feet from the shoreline's ordinary high water mark.
- Interdunal wetlands are frequently associated with many rare and endangered plant species and their associated fauna and should be given careful consideration for protection.
- Consider policies which emphasize the protection of dunes outside of designated public access locations in order to protect the dunes from anthropogenic impacts.
- Consider addressing erosion hazards on the coast through critical areas regulations.

Dredging and Dredge Material Disposal

- Grays Harbor is subject to continued sedimentation. It is likely that dredging for navigation and flood control will continue to be needed in the future. Provisions to allow continued dredging as part of a master program will facilitate needed dredging while addressing long-term ecological issues. This includes acknowledging the Corps of Engineers plans to deepen the Grays Harbor navigation channel by two feet.
- Except for purposes of shoreline restoration, flood hazard reduction, and maintenance of existing legal moorage and navigation, consider prohibiting these modifications.
- Consider identifying upland dredge disposal in shoreline jurisdiction as a water-dependent use when the material is extracted for navigation channel maintenance or flood control purposes when it is cost-prohibitive to dispose of the material outside shoreline jurisdiction.

Shoreline Habitat and Natural Systems Enhancement Projects

- Consider incentives to encourage restoration projects, particularly in areas identified as having lower function. For example, allow modification of impervious surface coverage, density, height, or setback requirements when paired with significant restoration. Emphasize that certain fills, such as streambed or nearshore gravels or material to anchor logs, can be an important component of some restoration projects.

7.4 Shoreline Uses

Agriculture

- Maintenance of existing agriculture is commercially and locally important to Grays Harbor County. This should be recognized in shoreline policies.
- The findings of this Shoreline Analysis Report do not suggest a need for additional regulations beyond those mandated by the SMP Guidelines.
- Consider allowing low-intensity agricultural uses in the Natural environment per WAC 173-26-211(5)(a)(ii)(E).

Aquaculture

- Maintenance of existing aquaculture is commercially important to Grays Harbor County. This should be recognized in shoreline policies.
- The regulations should appropriately differentiate between commercial aquaculture and species restoration aquaculture, and include special provisions for aquaculture activities that are temporary in nature.

Boating Facilities

- Grays Harbor County includes a variety of commercial, public and private boating facilities, including marinas, port uses, and community and park boat moorage and launching facilities. Regulations for the over-water components should be developed to provide applicants with as much predictability as possible, while still allowing for an appropriate amount of flexibility based on site-specific conditions and use-specific needs.
- Public access should be included as components of new marinas or expansions, where feasible.

Commercial Development

- Recognize commercial uses and provide for a clear priority for water-dependent, water-related and water-oriented uses.
- Consider incentives to attract water-oriented uses in appropriate locations along the shoreline.
- Ensure water-dependent uses are not restricted by other regulatory setbacks/buffers.
- Make provisions for public access and ecological restoration requirements for non-water-dependent uses to provide clear requirements for those areas where water-dependent uses are not practical. Identification of mitigation sites or provisions for mitigation banking also could accommodate such development.

Forest Practices

- Provide general policies and regulations for forest practices according to the SMP Guidelines. As provided for in WAC 173-26-241(3)(e), the master program should rely on the Forest Practices Act for regulation of commercial forestry. There are, however, specific limits on clear cutting provided in RCW 90.58.150 which must be included. Exceptions to this standard should be by conditional use review.
- The SMP standards should apply to Class IV General Forest Practices where shorelines are being converted to non-forestry uses.

Industry

- Recognize industrial uses and provide for a clear priority for water-dependent, water-related and water-oriented uses.
- Consider incentives to attract water-oriented uses in appropriate locations along the shoreline.
- Ensure water-dependent uses are not restricted by other regulatory setbacks/buffers.
- Make provisions for the public access and ecological restoration requirements for non-water-dependent uses to provide clear requirements for those areas where water-dependent uses are not practical. Identification of mitigation sites or provisions for mitigation banking also could accommodate such development.

In-stream Structural Uses

- Small and large-scale in-stream structures intended to store water, moderate flooding, and retain sediment are found in Grays Harbor County. Therefore, policies and regulations should allow such in-stream structural uses in the SMP while also ensuring the continued protection and preservation of ecosystem functions and cultural resources.

- Regulations may distinguish appropriate areas for in-stream structures based on Shoreline Environmental Designations or specific ecological functions.

Mining

- Ensure that sand mining provisions on coastal lands are consistent with the Seashore Conservation Area of Washington State Parks.
- Provide general policies and regulations for mining according to the SMP Guidelines.
- Maintain existing maximum gravel bar mining quantities or consider other approaches to ensure that gravel bar mining does not degrade ecological functions.
- Consider policies which emphasize relocating mining away from shorelines, floodplains, and streams.
- Clearly differentiate between upland and aquatic mining.

Recreational Development

- Policies and regulations related to parks management should provide clear preferences for shoreline restoration consistent with public access needs and uses. Existing natural parks should be protected and enhanced.
- Coordinate with State, County, and private park owners regarding applicable environment designations, existing and future land uses/developments, and restoration opportunities to ensure policies and regulations do not conflict with ongoing or future recreational developments and park management plans.
- Recreation access to the shoreline is a priority of the Act and should recognize that water-dependent recreation is a preferred use in shoreline jurisdiction. Include provisions for existing and potential recreational uses, including boating, kayaking, swimming, and fishing.
- New shoreline access should be located and designed to maintain ecological functions.

Residential Development

- Recognize current and planned shoreline residential uses with adequate provision of services and utilities as appropriate to allow for shoreline recreation and ecological protection.
- Address specific unincorporated areas of more intense residential development (i.e. Moclips) with appropriate regulations to match the existing condition.
- Incorporate clear dimensional criteria for residential development, including setbacks/buffers, lot coverage, height limits, etc.

- Include provisions which ensure that new development, including the creation of new lots, would not require new shoreline stabilization. New primary and accessory residential structures should be located far enough from the shoreline to prevent such a need.
- For residential subdivisions that create five or more lots, require public or community access to the shoreline.
- Although single-family residential development is a shoreline preferred use, ensure that the master programs include provisions which assure meeting Ecology's no net loss standard.

Transportation and Parking

- Allow for maintenance and improvements to existing roads, parking areas, or other transportation facilities.
- For necessary new roads and parking areas, ensure that alternatives are considered which evaluate the feasibility of locating outside of shoreline jurisdiction.
- Include provisions specific to new forest roads and culvert replacements associated with existing forest roads. Provisions should address siting and impact avoidance and minimization measures.

Utilities

- Allow for maintenance and improvements to existing utility facilities.
- Ensure that location of new utilities considers alternatives to location within shoreline jurisdiction and provide performance standards for necessary new utilities where other locations outside of shoreline jurisdiction are not feasible.

7.5 Restoration Plan

A Restoration Plan document will be prepared at a later phase of the Shoreline Master Program update process, consistent with WAC 173-26-201(2)(f). The Shoreline Restoration Plan must address the following six subjects (WAC 173-26-201(2) (f) (i-vi)) and incorporated findings from this analysis report:

(i) Identify degraded areas, impaired ecological functions, and sites with potential for ecological restoration;

(ii) Establish overall goals and priorities for restoration of degraded areas and impaired ecological functions;

(iii) Identify existing and ongoing projects and programs that are currently being implemented, or are reasonably assured of being implemented (based on an evaluation of funding likely in the foreseeable future), which are designed to contribute to local restoration goals;

(iv) Identify additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs;

(v) Identify timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals; and

(vi) Provide for mechanisms or strategies to ensure that restoration projects and programs will be implemented according to plans and to appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals.

The Restoration Plan will "include goals, policies and actions for restoration of impaired shoreline ecological functions. These master program provisions should be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program." The Restoration Plan will mesh potential projects identified in this report with additional projects, regional or local efforts, and other programs provided by watershed groups and environmental organizations that contribute or could potentially contribute to improved ecological functions of the shoreline.

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9 LIST OF ACRONYMS AND ABBREVIATIONS

ADA............................ Americans with Disabilities Act
AU............................... Assessment Unit
BOEM.......................... Bureau of Ocean Energy Management
CBW............................ Colonel Bob Wilderness
CER............................. Cultural, Entertainment, and Recreation
CFS.............................. Cubic Feet per Second
CIT .... Chehalis Indian Tribe
CMZ............................ Channel Migration Zone
Corps .... U.S. Army Corps of Engineers
CRLC .... Columbia River littoral cell
CSZ .... Cascadia Subduction Zone
DBH............................ Diameter at Breast Height
DFIRM........................ Draft Flood Insurance Rate Map
DMMO....................... Dredged Material Management Office
DPS .... Distinct Population Segment
DU .... Dwelling Unit
Ecology....................... Washington Department of Ecology
EF .... East Fork
EPA............................. Environmental Protection Agency
EPRI............................ Electric Power Research Institute
ESA .... Endangered Species Act
ESU .... Evolutionarily Significant Unit
FEMA .... Federal Emergency Management Agency
FERC........................... Federal Energy Regulatory Commission
GHEMP....................... Grays Harbor Estuary Management Plan
GIS .... Geographic information systems
GMA........................... Growth Management Act
HPA .... Hydraulic Project Approval
KW.............................. Kilowatt
LE .... Lead Entity
LIDAR........................ Light Detection and Ranging
LWD .... Large Woody Debris
OHWM....................... Ordinary High Water Mark

ONF .... Olympic National Forest
ONP .... Olympic National Park
MF .... Middle Fork
MOU .... Memorandum of Understanding
MRLC .... Multi-Resolution Land Characteristics
NAP .... Natural Area Preserve
NF .... North Fork
NLC .... National Land Cover
NMFS.......................... National Marine Fisheries Service
NPS .... National Parks Service
NPDES......................... National Pollutant Discharge Elimination System
NRCS .... Natural Resources Conservation Service
NWI .... National Wetlands Inventory
PCB .... Polychlorinated biphenyl
PHS .... Priority Habitats and Species
QDNR.......................... Quinault Natural Resource Department
QIN .... Quinault Indian Nation
QIR.............................. Quinault Indian Reservation
RCW .... Revised Code of Washington
RM .... River Mile
SCA .... Seashore Conservation Area
SF................................. South Fork
SFR.............................. Single Family Residential
SMA .... Shoreline Management Act
SMP............................. Shoreline Master Program
Spp. .... Species
SR .... State Route
SSURGO...................... Soil Survey Geographic Database
TCU............................. Transportation, Communications, and Utilities
TMDL .... Total Maximum Daily Load
TWh .... Terrawatt-hours
UGA............................ Urban Growth Area
USDA.......................... U.S. Department of Agriculture
USFS .... U.S. Forest Service
USFWS .... U.S. Fish and Wildlife Service
USGS........................... U.S. Geological Service

UT .... Upper Tributary
W .... Watt
W WA .... Western Washington
WB .... West Branch
WAC .... Washington Administrative Code
WDFW .... Washington Department of Fish and Wildlife
WDNR .... Washington Department of Natural Resources
WSPRC .... Washington State Parks and Recreation Commission
WF .... West Fork
WRIA .... Water Resource Inventory Area

APPENDIX A

Grays Harbor County Assessment of Shoreline Jurisdiction

THE WATERSHED COMPANY

SCIENCE & DESIGN

10 January 2014

Kevin Varness
Grays Harbor County
Utilities and Development Division
100 West Broadway, Suite 31
Montesano, WA 98563

Re: Proposed Grays Harbor County Shoreline Jurisdiction

Dear Kevin:

The Watershed Company (TWC), working in collaboration with the project team, has developed a preliminary map showing the proposed shoreline jurisdiction for the Shoreline Master Program (SMP) update for Grays Harbor County (County). [Enclosed]

The proposed shoreline jurisdiction shown in the map is determined based upon the State Shoreline Management Act (SMA) and current Washington Department of Ecology (Ecology) rules and guidance documents. Under the SMA, all of the following areas are regulated as "Shorelines of the State" under the SMP:

- Marine waters
- Streams and Rivers with over 20 cubic feet per second (cfs) mean annual flow; their floodway and contiguous floodplain areas extending 200 feet from the floodway;
- Lakes 20 acres or greater in size, measured from Ordinary High Water Mark (OHWM);
- Shorelands 200 feet landward from the OHWM of all marine waters, jurisdictional streams, rivers, and lakes; and
- Associated wetlands that are hydrologically connected to any of the shorelines described above, located within 200 feet of a jurisdictional waterbody, or are entirely/partly located within the waterbody's 100-year floodplain.

Our first step towards updating the County's shoreline jurisdiction was to review the precise shoreline boundaries and associated wetlands definitions found in the SMA and Ecology rules and guidance documents. We then compiled and reviewed existing GIS data to determine the best available data from which to assemble shoreline jurisdiction. Table 1 below lists the specific GIS data components that were used to assemble shoreline jurisdiction.

Table 1. Grays Harbor Shoreline Jurisdiction Component Data.

Component	Source Layer Name	Source Layer Agency	Source Layer Date	Notes on Usage
20 CFS, 1,000 CFS	SMA_Pnts_Sugg.shp (Point)	Ecology	January 2010	This layer provides the upstream extent of proposed jurisdiction based on the USGS study (described below), and those rivers which are considered Shorelines of Statewide Significance
Ordinary high water line	1. MSP_Combined_Shoreline.shp (Polyline) 2. NHDFlowline (Polyline) 3. NHDArea (Polygon) 4. NHDWaterbody (Polygon) 5. SMA_Poly_Adopt.shp (Polygon)	1. WA Marine Spatial Planning 2. USGS (National Hydrography Dataset) 3. USGS (National Hydrography Dataset) 4. USGS (National Hydrography Dataset) 5. WA Department of Ecology	1. 2013 2. 2013 3. 2013 4. 2013 5. 2012	OHWM of Grays Harbor and Pacific coastline (#1 &2), rivers (#3), and waterbodies (#4 &5). Stream centerline (#2) was used for smaller tributaries.
Floodway (Preliminary DFIRM)	S_FLD_HAZ_AR.shp (Polygon)	FEMA (provided by Grays Harbor County)	2013	Areas coded FW under "FLOODWAY" field
100 year Floodplain (Preliminary DFIRM)	S_FLD_HAZ_AR.shp (Polygon)	FEMA (provided by Grays Harbor County)	2013	Areas coded either A, AE, AH, AO or VE under "FLD_ZONE" field
Potentially Associated Wetlands	CONUS_wet_poly (Polygon)	USFWS (National Wetland Inventory)	2013	These mapped wetlands have not been field verified and are for informational purposes only

While the proposed shoreline jurisdiction reflects the best available data, the level of accuracy remains limited and might require ground-truthing at the time of a development action review. Particularly in areas with dynamic ecological processes like estuarine and marine influences or stream/river meandering, site-specific analysis of the OHWM, wetland boundary and connectivity will be needed. Each jurisdiction map therefore will include the following disclaimer, derived from Ecology's recommendation:

> *"Shoreline jurisdiction boundaries depicted on this map are approximate. They have not been formally delineated or surveyed and are intended for planning purposes only. Additional site-specific evaluation at the project level may be needed to confirm/verify information shown on this map."*

Marine Waters

Marine shorelines and the area 200 feet landward of the OHWM are included under the County's proposed shoreline jurisdiction, except for marine shorelines encompassed by the Cities of Ocean Shores and Westport. Shorelines within the Quinault Indian Reservation are included in the mapping and will be included in the analysis, however the SMP development process for these tribal areas will be separate from the County's. The National Hydrography Dataset published by USGS[1] was used as the marine shoreline boundary (OHWM) for the county's Pacific coastline, as well as the southwestern portion of Grays Harbor between City of Westport and west of Johns River. For the rest of the Grays Harbor and nearshore estuary system, the combined marine shoreline identified in the Final Report of Coastal Marine Spatial Planning Priorities of 2013[2] was deemed more accurate and was used to delineate that portion of marine OHWM instead of the National Hydrography Dataset.

The Pacific coast shoreline including harbors, bays, estuaries, and inlets, seaward from the ordinary high water mark and all shorelands associated with these waters are also considered "Shorelines of Statewide Significance", a special category of shorelines where specific priority uses are preferred.

Streams/Rivers

The upstream limit of shoreline jurisdiction for streams and rivers is that point where the mean annual flow shifts from greater than 20 cubic feet per second (cfs) to less than 20 cfs. The upstream 20 cfs point is based on a 2003 study by USGS provided by Ecology[3]. For purposes of this preliminary map set, shoreline jurisdiction is shown extending up to the USGS 20 cfs points as directed by Department of Ecology. Based on the USGS data, there are 208 distinct streams/rivers and tributaries which meet the SMP shoreline definition in the County.

Additionally, the current County preliminary FEMA DFIRM flood data (2013) was used to identify both the floodway and 100-year floodplain, where present. Per the SMA, all areas within the floodway are included as part of shoreline jurisdiction, as well as the area up to 200 feet landward of the floodway where a contiguous floodplain is present.

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[1] http://nhd.usgs.gov/
[2] Final Report: Coastal MSP Priorities, June 30, 2013. University of Washington Olympic National Resources Center
[3] http://www.ecy.wa.gov/programs/sea/pubs/USGS_reports/WRIR%2096-4208.pdf

All streams and rivers which have mean annual flow of 1,000 cfs or greater are considered Shorelines of Statewide Significance. Within Grays Harbor County, the following streams and rivers meet this definition:

- Chehalis River;
- Humptulips River (mainstem);
- Quinault River;
- Satsop River (East Fork and mainstem);
- North Creek (southernmost portion, downstream from the mouth of Lower Salmon Creek);
- Wynoochee River (downstream from the mouth of Schafer Creek); and
- Queets River (a small portion in the northwestern corner of the county).

Lakes

Within unincorporated Grays Harbor County, three lakes are currently listed by WAC 173-20-300 as Shorelines of the State (Failor Lake and two unnamed lakes). Failor Lake is a 60 acre lake approximately 6 miles north of the City of Hoquium. One of the unnamed lakes is actually part of the lower portion of Mox Chehalis Creek, near Malone (Figures 1 and 2) and therefore should not be considered as an individual waterbody. The second of these unnamed lakes is located approximately 4 miles north of Humptulips, just west of Hwy 101. Based on review of current and historical aerial photography (Figures 3-5), which indicates that the feature is likely wetland rather than an open water lake, this feature should not be considered as a shoreline jurisdictional waterbody.

Figure 1: Shoreline polygon near Malone as currently listed under WAC 173-20-300

Figure 2: View of 2013 aerial image (Google Earth 5/5/13) of mouth of Mox Chehalis Creek near Malone.

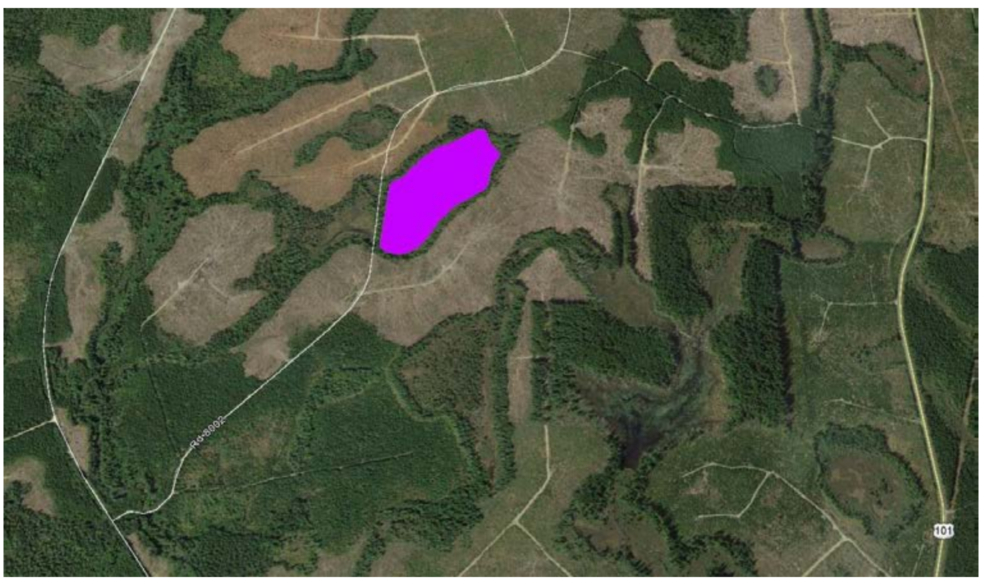

Figure 3: Shoreline polygon north of Humptulips as currently listed under WAC 173-20-300

Figure 4: View of 2013 aerial image (Google Earth 5/5/13) depicting wetland and no open water for the unnamed lake.

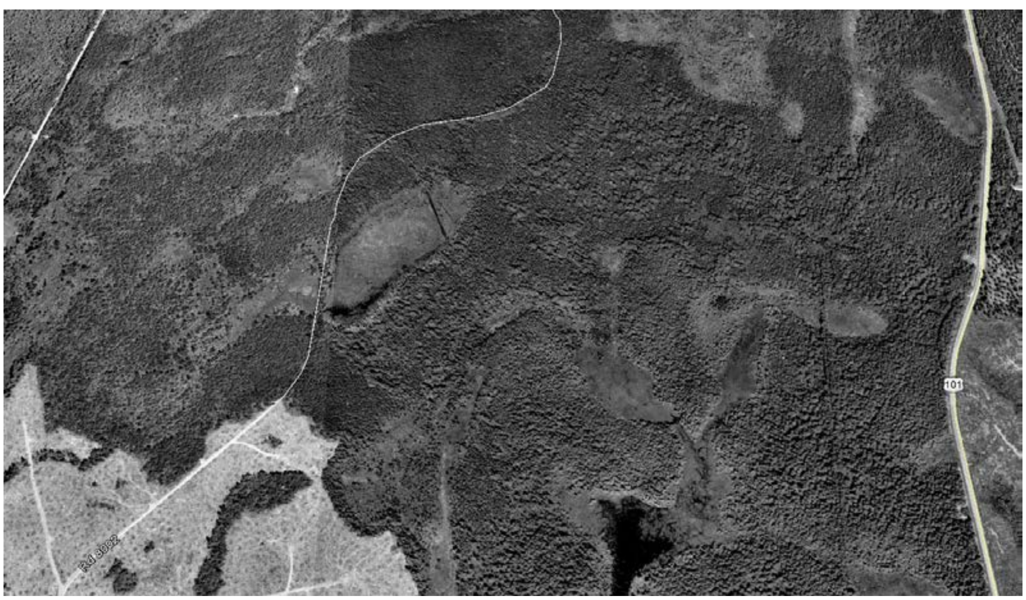

Figure 5: Historical view of USGS 1994 aerial image (Google Earth) also depicting wetland and no open water for the unnamed lake.

Upon further examination of the National Hydrography Dataset, Ecology's suggested shoreline polygons, and current and historical aerial photographs, an additional four lakes are proposed for consideration. These include, Lake Quinault, Wynoochee Lake, Moores Lake near Elma (~36 acres), and one unnamed lake (~21 acres) near the City of McCleary (referred to as "unnamed pond" on the enclosed maps). Figure 6 shows the location of this unnamed waterbody.

Figure 6: 2013 aerial image of an unnamed waterbody (~21 acres) near the City of McCleary.

As mentioned above, Ecology's suggested shoreline polygons (which is based upon the National Hydrography Dataset) was reviewed along with current and historical aerial photographs to determine if any other suggested waterbodies should be considered as Shorelines of the State. Although an additional 41 polygons are included in this dataset, only the four listed above appear to include open water.

Lakes greater than 1,000 acres are considered Shorelines of Statewide Significance. Two lakes within unincorporated Grays Harbor County meet this criterion (Lake Quinault and Wynoochee Lake).

Associated Wetlands

Associated wetlands are those that are "in proximity to and either influence or are influenced by … a lake or stream subject to the Shoreline Management Act" and "[t]he entire wetland is associated if any part of it lies within the area 200 feet from either the ordinary high water mark or floodway" or "if any part is located within the 100 year floodplain of a shoreline"[4]. Wetlands meeting the latter two criteria are mapped as "Potentially Associated Wetlands" in the attached map. Location and boundary of these wetlands are drawn from GIS data of National Wetlands Inventory (NWI).

Non-associated wetlands are intentionally omitted from this map set. However, wetlands that are either outside of the floodplain or the 200-foot standard shorelands area may still be

[4] http://www.ecy.wa.gov/programs/sea/sma/st_guide/jurisdiction/Shorelands.html

associated on the basis of a hydraulic connection to the shoreline. Wetlands that are separated by an obvious topographic break from the shoreline are not associated, provided they are outside the shoreland zone, and that the break is not an artificial feature such as a berm or road. These possible additional shoreline-associated wetlands can only be determined on a project-level basis at the time of permit application. Further, the NWI wetland data are drawn from high resolution aerials and might not be completely accurate at a parcel level. Therefore, actual wetland presence and boundaries must be verified at the project level.

Optional Shoreline Jurisdiction Boundaries

The information above describes assembly of the minimum shoreline jurisdiction. The County may further elect to expand jurisdiction to include:

> 1) All or part of the 100-year floodplain, and/or
>
> 2) Buffers of associated wetlands[5] that would otherwise encompass areas outside of shoreline jurisdiction.

Under either of these options, the area of shoreline jurisdiction increases and additional properties or areas of properties would be subject to the SMP and its additional layer of permitting requirements.

RCW 36.70A.480(6) says "If a local jurisdiction's master program does not include land necessary for buffers for critical areas that occur within shorelines of the state, as authorized by RCW 90.58.030(2)(f), then the local jurisdiction shall continue to regulate those critical areas and their required buffers pursuant to RCW 36.70A.060(2)." Ecology's SMP Handbook chapter on Shoreline Jurisdiction explains the implications of this RCW as follows:

> If the local government chooses not to extend its shoreline jurisdiction under *RCW 90.58.030(2)(f)(ii),* the CAO will protect the entire critical area and its buffers (see *RCW 36.70A.480(6)).* The CAO will continue to apply to the entire critical area and its buffers, even after SMP approval. However, the SMP will <u>also</u> apply to the portion(s) of the critical area and its buffers that lie within shoreline jurisdiction. This means the subject critical area and some or all of its buffers will have "dual coverage" with regulation by both the SMP and the CAO.

Thus, extending SMA jurisdiction helps to reduce regulatory duplication in the future. This is a fundamental issue that should be carefully considered by the County. The attached map

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[5] The RCW actually allows for expansion of jurisdiction to include *critical area* buffers, not just wetland buffers. However, this generally is limited to wetland buffers in practice. The nature of non-shoreline streams as a mostly perpendicular element to a shoreline waterbody already brings their full buffer into shoreline jurisdiction. Geologically hazardous areas are generally assigned a setback, not a buffer. Critical aquifer recharge areas (CARAs) are not addressed in the SMA or SMP Guidelines, and CARAs further are not assigned a setback or a buffer.

currently does not include expanded shoreline jurisdiction to include critical area buffers and/or floodplain. Classification of associated wetlands, which would ultimately determine the regulatory buffer, has not been conducted and would be done on a site-by-site basis at the time of a development application. Evaluation of the impact from expanding jurisdiction to include floodplains can be assessed by viewing the floodplain maps which will be provided in the Shoreline Inventory Map Folio (in development).

Federal & Tribal Land Ownership

The SMA generally does not include federal and tribal lands in shoreline jurisdiction. As stated in RCW 90.58.280: "The provisions of this chapter shall be applicable to all agencies of state government, counties, and public and municipal corporations and to all shorelines of the state owned or administered by them." However, WAC 173-27-060 says that "lands subject to nonfederal ownership, lease or easement, even though such lands may fall within the external boundaries of a federal ownership" are subject to the SMA. For these purposes all federal and tribal lands will be included in the mapping and analysis. Provisions can be included in the County SMP addressing any future unanticipated nonfederal leases or easements on federal lands adjacent to shoreline waterbodies. The actual SMP development for tribal and federal areas will be a separate process.

The proposed shoreline jurisdiction excludes areas within the Cities of Ocean Shores, Westport, Aberdeen, Cosmopolis, Elma, Hoquiam, McCleary, Montesano and Oakville.

Please call if you have any questions.

Sincerely,

Dan Nickel
Environmental Engineer

Enclosures

APPENDIX B

Shoreline Inventory Map Folio

APPENDIX C

Comments Received on Draft Shoreline Analysis Report

State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: 600 Capitol Way N · Olympia, WA 98501-1091 · (360) 902-2200, TTY (800) 833-6388
Main Office Location: Natural Resources Building · 1111 Washington Street SE · Olympia, WA

June 16, 2014

Kevin Verness, Director
Gray Harbor Department of Public Services
100 W. Broadway
Montesano, WA 98563

SUBJECT: Comments Regarding the Preliminary Draft Shoreline Analysis Report for Shorelines in Grays Harbor County (April 2014)

Dear Mr. Verness:

The State of Washington Department of Fish and Wildlife (WDFW) appreciates the opportunity to review the preliminary Draft Shoreline Master Analysis Report for Grays Harbor County, dated April 2014. We have prepared comments for your consideration. Some comments address specific content, but many of the comments are in regards to the format of the report. Please note that we did not receive a copy of the map folio, and therefore have no comments on it at this time.

3.4.1 Freshwater Habitats

Wetlands are an important component of freshwater shorelines, providing habitat for fish and other wildlife. We would like to see wetlands included in the discussion of key associated habitats.

Riparian areas provide critical habitat for terrestrial and avian species as well as aquatic species. We would like to see this section go beyond water quality and fish. For further information on the significance of riparian areas to wildlife, please see *Management recommendations for Washington's priority habitats and species: riparian* (WDFW, 1997).

3.4.3 Priority Habitats and Species

We are pleased to see WDFW's Priority Habitats and Species (PHS) list included in this section. However, there is no explanation as to what the PHS program is or why it is included here. We recommend adding a description of the WDFW PHS program so that readers can understand the meaning of the table. We also recommend differentiating it from the plant list and salmon discussion. Perhaps subsections would be appropriate. The county may want to consider removing habitats and species that do not occur in the shoreline jurisdiction in order to avoid confusion.

We recommend including commonly occurring species as well as habitats and species of local importance, such as those that are protected under the county's Critical Areas Ordinance.

4.2 Inventory Sources

We encourage the use of additional data sources, if possible. For example, the only fish, wildlife and habitat data listed is from WDFW's PHS database. Other potential sources may include local tribes, organizations such as the Nature Conservancy, the Center for Natural Lands Management (CNLM) or other land trusts, local Audubon chapters, regional fisheries enhancement groups, etc. Another source, the Washington Department of Ecology's online Coastal Atlas, was referenced on page 196 but it is unclear what data was used and how it was used.

The National Wetland Inventory (NWI) is a good starting point for wetland mapping, but we are pleased to see that it will not replace site-specific studies. The NWI is currently being updated, and it is important to be sure that the latest version is being used. We encourage the use of more specific county data where it is available, particularly if the involves ecologically significant wetlands.

4.3.1 Ecological Characterization

Wetlands: Table 4-1 indicated that NWI data was not to be used in place of site-specific studies. However, we find in 4.3.1 that only the NWI data was included in the inventory and analysis. We recommend using county data where it provides better information.

Fish and Wildlife Habitat Conservation Areas: Locations such as DNR Natural Heritage Program sites, WDFW Wildlife Areas, refuges, preserves and other areas specifically designated for conservation are useful to include in the inventory. They can assist in determining appropriate shoreline environmental designations (SEDs).

4.3.2 Land Use Characterization

Water Oriented Use: Table 4-2 does not seem to serve a particular purpose. How do the definitions of water-oriented uses relate to the shoreline inventory and characterization?

4.4 Assessment Unit Inventory Conditions

The purpose of this section is not clear. The statistics found in table 4-3 are of limited use because the management units cover very large areas. These statistics would be much more useful for determining SEDs and describing baseline conditions if they were broken out at the reach level. The inclusion of land use patterns broken into current use, Comprehensive Plan and Zoning is very informative. It would be particularly useful at the reach level.

5.1.1 Reach Delineation

The method employed to determine reach breaks is problematic. Strong emphasis has been placed on current land use. Typically, reaches are broken out based on physical and ecological features (e.g., Jefferson County Final Shoreline Inventory and Characterization Report-Revised). This second approach results in reaches that are more logical for analysis of ecological functions. Delineation based primarily on land use produces reaches that may break up ecological processes and thus make them more difficult to accurately identify and describe. In order to effectively describe ecosystem and shoreline processes, we recommend re-configuring the reach breaks by weighing physical, ecological and land use characteristics in that order.

There is also a sentence suggesting that shoreline environmental designations (SEDs) are being guessed at ahead of the inventory and characterization report. WDFW finds this approach inappropriate. The inventory and characterization report is intended to inform SEDs, not vice versa. WAC 173-26-201 (3)(f) clearly states that SEDs should be assigned based on the shoreline inventory and analysis. SEDs may in some cases end up mirroring reach breaks, but that should not have been determined yet. Please realize that reach breaks do not have to contain only one SED, they may contain several. Likewise, an SED segment may extend beyond a reach break. There is no need or legitimacy to predicting SED boundaries at this stage of the SMP update process.

5.1.2 Functions and Impairments

Reach-level functional analysis is conducted in this report by use of a scoring system. Unfortunately, this scoring system is problematic in multiple ways. It severely oversimplifies the data. A reader cannot tell whether the scoring reflects a problem or the natural state of the reach. It does not measure the correct metrics for judging whether a system is functioning normally or is impaired, and it is completely silent on sources of impairment. For example, the "Vegetation-total" score does not address the quality of the vegetation. It could be capturing the presence of a native plant community or a dysfunctional Scots broom monoculture. The scoring system also does not indicate whether a high or low score is appropriate for the habitat type. A healthy herbaceous bald will have no forest cover, thus influencing the "tree/forest cover" score for the entire reach in a way that appears negative. Section 5.1.3 touches on some of these problems, but offers no solutions for how the scores can be appropriately used.

The use of range-based scores, derived from percentages which have in turn been derived from real values, is puzzling at best and misleading at worst. Here are some examples from the indicators in the Habitat category of Table 5-4:

- Priority Habitats and Species: Habitat types and species are all lumped together. An arbitrary score is given based on a count of some sort. It is not specified whether the count is based on individual occurrences of a species/habitat type or if a species is only counted once even if it is recorded at multiple locations within a reach. The number is also misleading because the WDFW PHS dataset only contains *documented* occurrences of habitats and species. Lack of data must not be interpreted as lack of presence. Assigning a score to a reach implies that the entire area has been surveyed for all the PHS-listed habitats and species. Finally, use of a score suggests that reaches receiving a lower score are biologically or functionally inferior to those with a higher score. The oversimplification fails to recognize important information such as the presence of a particularly significant habitat patch or a federally protected species. It would be better to list the actual PHS species and habitats that have been documented in a reach. We would also like to see some information about species not on WDFW's PHS list, including commonly occurring species and important habitat area such as nesting sites or foraging areas. Comments about missing data would also be helpful, such as the lack of amphibian surveys in most areas.
- Wetlands: Why convert actual area to a score based on a percentage range? The actual area is much more useful information and yet it has disappeared completely. The score serves no defined purpose.
- Fish Passage Barriers: Creating a scoring system by counting the number of barriers is a severe oversimplification. The significance of a barrier depends on factors such as the fish species present, the severity of blockage, the location of the barrier within the watershed, and the amount of habitat that is rendered inaccessible.

WDFW strongly recommends eliminating the scoring system entirely from the report. It fails to capture important information and presents numbers imbued with false significance. The scores do not give any practical information regarding the impairments of a reach. Alternatively, we suggest using real values and narrative descriptions to accurately portray and analyze the ecosystem functions of the reaches.

5.2 Results

The assessment unit narratives provide a good start for general information in the results section. However, we find that the reach-level results are insufficient to describe ecological functions. As stated previously, we recommend eliminating the scoring system and using narratives and statistics to describe each reach. We also recommend employing enough information in the reach descriptions to allow them to stand independently rather than being minor sub-sections of the very large and broadly described assessment units. A standard format can be employed to provide consistency. The Draft Mason County Shoreline Master Program Update, Inventory and Characterization Report employs uniform, detailed reach sheets in addition to describing comprehensive ecosystem-scale processes. We recommend exploring that document for ideas. We would also like to see more information that is unique to individual reaches. Some examples include:

- Shoreline length
- Planned or completed restoration projects
- Protected areas
- Significant factors that influence functions: ecological, geological, anthropomorphic, etc.
- Biological sites of importance, such as large nesting colonies or established migration corridors
- Impacts of current land use on ecological functions. This is an important one!
- Limiting factors to restoration (e.g., railroad tracks that cut the riparian area off from the water for a significant distance)
- Perhaps a photo showing typical conditions when available (e.g., shoreline obliques from the Washington State Coastal Atlas)

The restoration opportunity tables are off to a good start. They would benefit from the addition of more specific information, such as the locations of restoration opportunities where they are known. It some cases this may be quite simple. In the Humptulips AU, there is mention of derelict piles and overwater structures at the mouth of Chenois Creek. Removal of creosote pilings is a specific and easily identified restoration opportunity. Some of the items listed in the restoration table do not seem to actually fall under the category of restoration. For example, community outreach and education is not restoration. We recommend continuing to develop the tables so that they can be concise, useful references over the long term.

6 Land Use Analysis

It would be appropriate to provide information here about how land use has impaired ecological functions, particularly in highly impacted areas. Make sure it is detailed enough to be useful for informing restoration plans and the cumulative impacts analysis. For example, pointing out where current zoning allows development that will disconnect a river from its floodplain.

Next Steps

As work on the shoreline analysis report continues, the county may want to consider increasing the level of targeted outreach for feedback. Comments received earlier in the process can help avoid delays at later stages. One option is to send the preliminary draft out for review by additional key stakeholders, such as local tribes and watershed groups, who can provide technical advice. Another option is to convene an advisory committee. This committee could be technical in nature and specific to the shoreline analysis report, or it could be an expanded group that remains involved throughout the various steps of drafting the SMP. Either way, additional input can help produce a report that is comprehensive and useful in the long-term.

The Washington Department of Fish and Wildlife wishes to thank you again for the opportunity to provide comments on the preliminary Draft Shoreline Analysis Report for Shorelines in Grays Harbor County (April 2014). We sincerely hope that you will find these comments constructive. Please do not hesitate to contact either one of us with any questions you may have about this letter.

Sincerely,

Gloria Rogers
Habitat Biologist
WA Department of Fish and Wildlife
48 Devonshire Rd
Montesano, WA 98563

Phone: (360) 249-1293
E-mail: Gloria.rogers@dfw.wa.gov

Theresa Nation
Habitat Biologist
WA Department of Fish and Wildlife
600 Capitol Way North
Olympia, WA 98501-1091

Phone: (360) 902-2562
E-mail: Theresa.nation@dfw.wa.gov

cc: John Kliem, Facilitator, Creative Community Solutions
Stan Nickel, The Watershed Company
Kim Van Zwalenburg, Shoreline Planner, WDOE
Keith Folkerts, Land Use Policy Lead, WDFW
Steve Kalinowski, Regional Habitat Program Manager, WDFW

References:

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Washington Department of Ecology. Electronic Reference. Washington State Coastal Atlas. https://fortress.wa.gov/ecy/coastalatlas/tools/ShorePhotos.aspx.

From: Van Zwalenburg, Kim (ECY) [mailto:kvan461@ECY.WA.GOV]
Sent: Thursday, July 24, 2014 1:30 PM
To: John Kliem (jmkliem@comcast.net); Dan Nickel
Cc: Kevin Varness (kvarness@co.grays-harbor.wa.us); Mraz, Richard A. (ECY)
Subject: Review of Grays Harbor Preliminary draft Inventory & Characterization

Hi John and Dan: Attached are comments from both Rick and myself after reviewing the June 2014 draft I & C.

In addition, we have the following general comments:

1. The discussion of uses and activities waterward of the OHWM on either the Pacific Ocean or Grays Harbor is scattered and incomplete. Within the estuary, aquaculture is an important activity that should be given more attention. If the County has maps of aquaculture tracts, these should be included. Washington Department of Health also has important information regarding approved commercial shellfish growing areas and those that are threatened or of concern: http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/GrowingAreas/AnnualReports.aspx In addition, there is useful information regarding recreational shellfish which is a key activity along the outer coast. The Marine Spatial Planning effort should help fill in some of the gaps with regard to commercial and recreational fishing and crabbing.
2. With regard to alternative energy potential, the report does adequately discuss tidal energy. However, there is no mention of the potential for wind energy. While it is likely the facilities would be located outside the 3-nautical mile limit, there would be a need to have transmission lines which connect to shore. This should be discussed. Dept. of Commerce contact: Tim Stearns
3. We recommend inserting representative photos of some of the areas discussed, including the ocean beaches and dunes, aquaculture facilities, Blue Slough (WADNR), state parks, etc. This will help break up the document and may provide a better sense of place for citizen readers. While this document should pull the available science and information together, it should also tell a story about the community. That story is missing.
4. There are have been significant efforts over the years by non-profits, state and federal agencies in protecting and conserving environmentally sensitive areas, including the Chehalis Surge Plain, Elliott Slough and the surge plains along the various forks of the Hoquiam River (Chehalis River Basin Land Trust). Broader discussion of these efforts should be included along with maps where available. Receiving almost no mention but key to the efforts that led to GHEMP, is the Grays Harbor National Wildlife Refuge. The location of all these lands is relevant when considering shoreline environment designations.
5. Please review the Restoration Opportunities tables for each assessment unit to ensure it lists those actions which can be taken to directly restore ecological functions. For example, the following are not “restoration opportunities”: assessing habitats, community outreach, BMPs, expansion of buffer widths. These may all be beneficial actions, and may be needed steps prior to an identifying the restoration opportunity, but are not a restoration opportunity in and of themselves.
6. Please explain the interpretation of agricultural land/uses as water-oriented. This is not an interpretation I am familiar with.
7. The information on public access in Table 4-3 and Chapter 6 should be consistent. In some cases, it appears Chapter 6 identifies more access points than the table.
8. I will follow up regarding the revised maps in the map folio.

Kim

Kim Van Zwalenburg
(360) 407-6520; FAX (360) 407-6305
e-mail: kim.vanzwalenburg@ecy.wa.gov

From: FLORES, HUGO (DNR) [mailto:HUGO.FLORES@dnr.wa.gov]
Sent: Monday, August 11, 2014 4:10 PM
To: jkliem@ccsolympia.com
Cc: Gibbs, Heather (DNR)
Subject: Grays Harbor Shoreline Analysis Report

Hello John,

I hope you are having a good summer and enjoying this hot weather. I have reviewed Section 7 of the Grays Harbor Shoreline Analysis Report (Report), which includes shoreline management recommendations. I have chosen this section because I believe this is where I can provide more expertise. The recommended environmental designations are in accordance with WAC 173-26-211(2)(a). I believe Grays County should consider adopting an aquatic shoreline environmental designation as recommended by the analysis report. As you know, aquaculture and shellfish farming is a significant activity within Grays Harbor and having a shoreline designation that specifically supports and protects this activity is essential. In addition to this, Section 6 of the Report does not include aquatic lands used for aquaculture/shellfish farming (See table 6.1, Countywide Shoreline Use Pattern, Page 149). I believe there is a significant amount of lands used for these uses. If these lands are absent from the future land use analysis, it would be good to have a shoreline designation that recognizes, supports and protects this activity. I believe the aquatic shoreline designation would be a good designation for these lands. (See definition for Aquatic environment WAC 123-26-211(5)(c)). The rest of the recommendations 7.2 General Policies and Regulations; 7.3 Shoreline Modification Provisions; and 7.4 Shoreline Uses, follow the requirements under the Guidelines (WAC 173-26) and I think they should be considered by Grays Harbor County.

I hope these comments are helpful. Let me know if you have questions.

Take care,

Hugo

Hugo Flores
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futurewise
Building communities
Protecting the land

October 24, 2014

Mr. John Kliem
Creative Community Solutions
2203 Overhulse Road NW
Olympia, Washington 98502

Dear Mr. Kliem:

Subject: Comments on the *Shoreline Analysis Report for Shorelines in Grays Harbor County* (August 2014)
Sent via email to: jkliem@ccsolympia.com

Thank you for the opportunity to comment on the *Shoreline Analysis Report for Shorelines in Grays Harbor County*. Overall, we believe the analysis report provides the basis for a high quality update to the Grays Harbor Shoreline Master Program. In particular we support the following features of the report:

- Mapping and analyzing the locations of priority habitats and species. These are valuable and limited habitats necessary to protect important fish and wildlife.

- Mapping shellfish culture areas.

- Mapping natural hazards including tsunami hazards.

- The discussion and analysis of various habitat types.

- The helpful recommendations for updating the shoreline master program.

We do have some recommendations for strengthening the analysis report and the recommendations for the shoreline master program update.

***Map shoreline vegetation to guide shoreline environments, shoreline buffers, and vegetation protection measures*.**

WAC 173-26-201(3)(c)(i) and (ii) require the identification of vegetation including "native aquatic vegetation" and "riparian and associated upland plant communities."[1] WAC 173-26-201(3)(c)(i) requires that "[s]pecial attention should be paid to identification of

[1] Despite their name, the Shoreline Master Program Guidelines are binding state agency rules with which the shoreline master program update must comply. RCW 90.58.030(3)(c); RCW 90.58.080(1) & (7); RCW 90.58.090(3) & (4); RCW 90.58.190(2)(b) & (c).

ecologically intact blocks of upland vegetation [and] developed areas with largely intact riparian vegetation, ….”[2]

WAC 173-26-201(3)(c)(vii) provides that in preparing a shoreline master program update counties and cities are to:

> Identify how existing shoreline vegetation provides ecological functions and determine methods to ensure protection of those functions. Identify important ecological functions that have been degraded through loss of vegetation. Consider the amount of vegetated shoreline area necessary to achieve ecological objectives. While there may be less vegetation remaining in urbanized areas than in rural areas, the importance of this vegetation, in terms of the ecological functions it provides, is often as great or even greater than in rural areas due to its scarcity. Identify measures to ensure that new development meets vegetation conservation objectives.

WAC 173-26-211(5) requires vegetation conservation for all shoreline environments but the “high-intensity” shoreline environment. So the careful mapping of shoreline vegetation is required for a shoreline master program update. Other provisions of the Shoreline Master Program Guidelines also require the conservation of vegetation. WAC 173-26-201(3)(d)(i)(C) documents that the Shoreline Master Program Guidelines focus so much attention on shoreline vegetation because of its water quality, habitat, and erosion protection benefits.

While we appreciate that Map 9, Land Cover, identifies shoreline vegetation and that the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County* discusses the functions of vegetation and rates vegetation functions on a reach by reach basis, vegetation is not identified at a fine enough scale to allow an analysis of the buffers widths needed to maintain the vegetation or to determine areas suitable for a “Natural” or “Urban Conservation” or “Rural Conservation” environment designations. We recommend that data on this scale be developed for at least the most high priority areas. This information could be developed as an addendum to the *Shoreline Analysis Report* or as part of the upcoming policy work.

Map channel migrations zones and protect people and property from these hazards.

WAC 173-26-221(2)(c)(iv) and WAC 173-26-221(3)(b) require the establishment and regulation of channel migration zones associated with streams and rivers. Channel migration zones are the areas in which rivers and streams have historically moved, taking

[2] WAC 173-26-191(2) provides in relevant part that “the term ‘should’ means that the particular action is required unless there is a demonstrated, compelling reason, based on a policy of the Shoreline Management Act and this chapter [the Shoreline Master Program Guidelines], for not taking the action[.]”

into account maintained dikes and other structures that minimize river and stream channel movement.

We recommend that Grays Harbor County work with the Washington State Department of Ecology to map the channel migration zones in Grays Harbor County. This will help protect people and property from the hazards of these dangerous areas. While WAC 173-26-201(3) indicates that it is preferable to include this information in the inventory and characterization report, it is not necessary to include it in the report as long as this information is available for at least the channel migration zones subject to the most development pressure during the development of the shoreline master program policies and regulations.

Map the potential effects of sea level rise.

In 2012, the National Research Council concluded that global sea level had risen by about seven inches in the 20th Century and would likely rise by 24 inches on the coast by 2100.[3] Dunes "can be expected to retreat quickly under rising sea levels and larger waves."[4] The general extent of the two feet of sea level rise currently projected for coast can be seen on the NOAA Coastal Services Center Sea Level Rise and Coastal Flooding Impacts Viewer available at: http://coast.noaa.gov/digitalcoast/tools/slr We think it would be helpful to include a map such as this in the report to help visualize the potential impacts on the Grays Harbor County coast and Grays Harbor.

Management Recommendations

We support the recommendation for two aquatic designations on page 252 to 253 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County*. For Grays Harbor and the Pacific Ocean, conditions vary significantly and protecting the most valuable in water habitats will help achieve the policy of the Shoreline Management Act and conserve the resources we all value.

We support the recommendation to use vegetation, impervious surface data, the ecological function results, and fish and wildlife habitats in designating shoreline environments on page 253 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County.* This approach will help conserve shoreline resources and is consistent with the Shoreline Master Program Guidelines.

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[3] National Research Council, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* p. 23 p. 96, p. 102, p. 108, p. 156 (2012). Accessed on October 23, 2014 at: http://www.nap.edu/catalog.php?record_id=13389
[4] *Id.* at p. 115

We recommend the adoption of shoreline buffers and setbacks to conserve vegetation in shoreline areas and to protect water quality and other aquatic resources. This will help conserve natural resources and is consistent with the Shoreline Master Program Guidelines. We agree the buffers and setbacks need to accommodate existing and planned water dependent uses. Water dependent uses also need measures to protect water quality and the community.

We support the Shoreline Vegetation Conservation recommendations on page 257 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County.* We also support the Water Quality, Stormwater, and Nonpoint Pollution recommendations on page 253 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County*. Maintaining existing vegetation in shoreline jurisdiction can help reduce stormwater runoff both into rivers and streams and onto downhill and downstream farmlands and other uses.

We support the Shoreline Stabilization recommendations on page 257 and 258 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County*. These suggestions will increase certainty for property owners and protect shoreline resources.

We support the Beach and Dunes Management recommendations on page 259 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County*. For the ocean and the estuary, new developments within tsunami hazard areas should, when possible, be outside the area of tsunami hazards. When that is not possible, they should incorporate evacuation routes or structures that allow users and residents to shelter in place where these measures are feasible.

We support the recommendations on page 259 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County* to include provisions which ensure that new development, including the creation of new lots, would not require new shoreline stabilization measures and to locate new primary and accessory structures outside the areas where new shoreline stabilization will be needed. The new lots and new buildings should be located to avoid damage from the storms and higher tides generated by sea level rise. These measures will help protect people and property from natural hazards.

We support the aquaculture recommendations on page 260 and the recreation recommendations on page 262 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County.* These provisions will help promote shoreline priority uses and to manage these uses. We also support the mining recommendations on page 262 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County* to help effectively manage these uses.

For all uses, including water dependent uses, the shoreline master program update should recognized the hazards inherent in a shoreline location, such as geological hazards, channel migration zones, and tsunamis. The shoreline master program update should include standards to protect people and property from these natural hazards and to ensure if a disaster strikes adverse impacts on the environment and other uses are avoided.

We support the development of a restoration plan to generate a net improvement in shoreline resources. A well done restoration plan can assist developments that may impact shoreline resources in ways that cannot be avoided by providing restoration opportunities the proposed development can carryout to offset these impacts.

We also support including the 100-year flood plain in shoreline jurisdiction. The county has historically used the 100-year as the basis for shoreline jurisdiction and this provides an appropriate level of review to protect people and property from natural hazards. It will also help protect water quality.

Again, thank you for the opportunity to comment on Grays Harbor County's Shoreline Inventory, Analysis and Characterization Report, and we look forward to continuing to work with the County on the Shoreline Master Program process has it goes forward.

Thank you for considering our comments. If you require additional information please contact me at 206-343-0681 Ext. 118 or tim@futurewise.org.

Very Truly Yours,

Tim Trohimovich, AICP
Director of Planning & Law

Don Hoch
Director

STATE OF WASHINGTON

WASHINGTON STATE PARKS AND RECREATION COMMISSION

1111 Israel Road S.W. • P.O. Box 42650 • Olympia, WA 98504-2650 • (360) 902-8500
TDD Telecommunications Device for the Deaf: 800-833-6388
www.parks.wa.gov

October 30, 2014

Mr. John M. Kliem
Creative Community Solutions, Inc.
2203 Overhulse Road NW
Olympia, Washington 98502

RE: Comments on Shoreline Analysis Report for Shorelines in Grays Harbor County, August 2014

Dear John:

Thank you for providing Washington State Parks and Recreation Commission (State Parks) with the draft Shoreline Analysis Report for Shorelines in Grays Harbor County for our review. The document does a very good job explaining existing shoreline conditions to help the County make decisions about how to manage its shorelines in the years to come. As State Parks has regulatory jurisdiction within the shoreline of the state, we appreciate the opportunity to provide clarity about our agency's management of lands within the Seashore Conservation Area (SCA).

Please consider our proposed edits to this document. I've arranged them by page number with our comments in red:

Page 4:
State-owned lands make up 12 percent of the total shoreland area. The Washington Department of Natural Resources (WDNR) owns approximately half of all State-owned shorelands. Other agencies that own shorelands in the County include the Washington State Parks and Recreation Commission (WSPRC),~~Department,~~ the Washington Department of Fish and Wildlife (WDFW), and the Washington State Department of Transportation (WSDOT).

Page 8:
Aside from the SMA, State regulations most pertinent to development in the County's shorelines include the State Hydraulic Code, the Growth Management Act (see Section 2.2.3 above), the State Environmental Policy Act, tribal agreements and case law, the Watershed Planning Act, the Water Resources Act, ~~and~~the Seashore Conservation Area (SCA), and the Salmon Recovery Act. A variety of agencies (e.g., Ecology, WDFW, WDNR, WSPRC) are involved in implementing these regulations or otherwise own shoreline areas. Ecology reviews all shoreline projects that require a shoreline permit, but has specific regulatory authority over shoreline conditional use permits and shoreline variances. Washington State Parks regulates ocean beach activities, including vehicular traffic, beach sand mining and recreational activities within the SCA and consistent with locally adopted and State Parks Commission approved ocean beach recreation management plans and other agency rules. Other agency reviews of shoreline developments are typically triggered by in- or over-waterwork, discharges of fill or pollutants into the water, or substantial land clearing.

(note: for information about ocean beach recreation management plans within the SCA, reference RCW 79A.05.650, 655, and 660)

Page 10:

Washington State Parks and Recreation Commission - Seashore Conservation Area: The Seashore Conservation Area (SCA), established in 1967, includes lands between the line of mean high tide and the line of mean low tide from Cape Disappointment to Ledbetter Point in Pacific County, from Toke Point in Pacific County to the south jetty in Grays Harbor County, and from Damon Point in Grays Harbor County to the Makah Indian Reservation, excluding areas within any Indian reservation (RCW 79A.05.605). ~~The SCA also includes lands that have been formed by accretion, which are above the present line of mean high tide, where private landowners~~ have granted State Parks with a deed of dedication. The purpose of the SCA is "to contribute toward providing people an opportunity to enhance their lives through recreational leisure time experiences and cause our environment to be protected, our heritage preserved, and our natural resources conserved" (Washington State Parks & Recreation Commission ~~2001~~1976).

The SCA establishes standards for ocean beach management, including provisions that regulate vehicular traffic within the SCA and mining for sand. In addition, State Parks has the responsibility to oversee the Seashore Conservation Line (SCL) survey approximately every 10 years, beginning in 1968. These surveys determine the rate of erosion and accretion, clarify ownership of "new" lands adjacent to Parks' properties, and assist in the overall management of the SCA. The repeated surveys are also mandated by Deeds of Dedication, which gave to the State, for public use, some of the accreted lands lying east and west of the SCL. The information gathered by the SCL surveys has helped southwest Washington city, county, and State agencies, local businesses, and landowners to make land use decisions about conservation, stewardship and development issues. Issues of boundaries and jurisdictions have historically been contentious; so the SCL surveys are a useful tool when issues of land ownership or user's rights are brought up.

Objectives set forth by the Washington State Parks and Recreation Commission for the ocean beaches in Grays Harbor and Pacific Counties include the following:

1. Acquire key ocean beach areas including lands west of the high tide line of 1889;
2. Acquire, one per biennium, a right-of-way for public recreational access to State owned tidelands and beaches within the State's Seashore Conservation Area;
3. Develop two ocean beach access areas per biennium;
4. Develop, one per biennium, a major saltwater, shoreland, or upland park providing public access to State-owned tidelands and beaches in the south Pacific County Coast (Washington State Parks & Recreation Commission 2001).

Page 59:

Existing and Potential Public Access

Information about Grays Harbor County shoreline public access facilities and potential opportunities was obtained from a review of federal, State, County, and state~~local~~ parks data, federal and state lands, and public access points. In addition to lands identified as public parks or lands managed specifically for public access, there are several areas identified as conservation easements or protected lands. These lands are generally managed for preservation.....

We hope these comments provide better clarity about State Parks' role in managing the Seashore Conservation Area. We look forward to reviewing in more detail the shoreline maps and proposed environment designations for State Parks properties to ensure continued recreational services for the community and the state. Please give me a call at (360) 902-8616 or email christine.parsons@parks.wa.gov if you have any questions.

Sincerely,

Christine Parsons

Christine Parsons, AICP
Policy and Performance System Manager
Washington State Parks and Recreation Commission

Received from Casey Dennehy,
Surfrider Foundation

October 31, 2014

John Kliem
Creative Community Solutions
2203 Overhulse Road NW
Olympia, WA 98502
jkliem@ccsolympia.com

Re: Comments on the *Shoreline Inventory, Analysis, and Characterization Report for Shorelines in Grays Harbor County*

To Whom It May Concern,

Thank you for the opportunity to comment on the *Shoreline Analysis Report for Shorelines in Grays Harbor County*. Overall, we believe the analysis report provides the basis for a high quality update to the Grays Harbor Shoreline Master Program. In particular we support the following features of the report:

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- Mapping shellfish culture areas.
- Mapping natural hazards including tsunami hazards.
- The discussion and analysis of various habitat types.
- The helpful recommendations for updating the shoreline master program.

We do have some recommendations for strengthening the analysis report and the recommendations for the shoreline master program update.

***Map shoreline vegetation to guide shoreline environments, shoreline buffers, and vegetation protection measures*.**

WAC 173-26-201(3)(c)(i) and (ii) require the identification of vegetation including "native aquatic vegetation" and "riparian and associated upland plant communities."[1] WAC 173-26-201(3)(c)(i) requires that "[s]pecial attention should be paid to identification of ecologically

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While we appreciate that Map 9, Land Cover, identifies shoreline vegetation and that the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County* discusses the functions of vegetation and rates vegetation functions on a reach by reach basis, vegetation is not identified at a fine enough scale to allow an analysis of the buffers widths needed to maintain the vegetation or to determine areas suitable for a “Natural” or “Urban Conservation” or “Rural Conservation” environment designation. We recommend that data on this scale be developed for at least the most high priority areas. This information could be developed as an addendum to the *Shoreline Analysis Report* or as part of the upcoming policy work.

Map channel migrations zones and protect people and property from these hazards.

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We recommend that Grays Harbor County work with the Washington State Department of Ecology to map the channel migration zones in Grays Harbor County. This will help protect people and property from the hazards of these dangerous areas. While WAC 173-26-201(3) indicates that it is preferable to include this information in the inventory and characterization report, it is not necessary to include it in the report as long as this information is available for at least the channel migration zones subject to the most development pressure during the development of the shoreline master program policies and regulations.

Map the potential effects of sea level rise.

In 2012 the National Research Council concluded that global sea level had risen by about seven inches in the 20th Century and would likely rise by 24 inches on the coast by 2100.[3] Dunes "can be expected to retreat quickly under rising sea levels and larger waves."[4] The general extent of the two feet of sea level rise currently projected for coast can be seen on the NOAA Coastal Services Center Sea Level Rise and Coastal Flooding Impacts Viewer available at: http://coast.noaa.gov/digitalcoast/tools/slr We think it would be helpful to include a map such as this in the report to help visualize the potential impacts on the Grays Harbor County coast and Grays Harbor.

Management Recommendations

We support the recommendation for two aquatic designations on page 252 to 253 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County*. For Grays Harbor and the Pacific Ocean, conditions vary significantly and protecting the most valuable in water habitats will help achieve the policy of the Shoreline Management Act and conserve the resources we all value.

We support the recommendation to use vegetation, impervious surface data, the ecological function results, and fish and wildlife habitats in designating shoreline environments on page 253 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County.* This approach will help conserve shoreline resources and is consistent with the Shoreline Master Program Guidelines.

We recommend the adoption of shoreline buffers and setbacks to conserve vegetation in shoreline areas and to protect water quality and other aquatic resources. This will help

[3] National Research Council, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* p. 23 p. 96, p. 102, p. 108, p. 156 (2012). Accessed on October 23, 2014 at: http://www.nap.edu/catalog.php?record_id=13389
[4] *Id.* at p. 115

conserve natural resources and is consistent with the Shoreline Master Program Guidelines. We agree the buffers and setbacks need to accommodate existing and planned water dependent uses. Water dependent uses need measures to protect water quality and the community.

We support the Shoreline Vegetation Conservation recommendations on page 257 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County.* We also support the Water Quality, Stormwater, and Nonpoint Pollution recommendations on page 257 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County*. Maintaining existing vegetation in shoreline jurisdiction can help reduce stormwater runoff both into rivers and streams and onto downhill and downstream farmlands and other uses.

We support the Shoreline Stabilization recommendations on page 257 and 258 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County*. These suggestions will increase certainty for property owners and protect shoreline resources.

We support the Beach and Dunes Management recommendations on page 259 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County*. For the ocean and the estuary, new developments within tsunami hazard areas should, when possible, be outside the area of tsunami hazards. When that is not possible, they should incorporate evacuation routes or structures that allow users and residents to seek shelter where these measures are feasible.

We support the recommendations on page 259 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County* to include provisions which ensure that new development, including the creation of new lots, would not require new shoreline stabilization measures and to located new primary and accessory structures outside the areas where new shoreline stabilization will be needed. The new lots and new buildings should be located to avoid damage from the storms and higher tides generated by sea level rise. These measures will help protect people and property from natural hazards.

We support the aquaculture recommendations on page 260 and the recreation recommendations on page 262 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County.* These provisions will help promote shoreline priority uses and to manage these uses. We also support the mining recommendations on page 262 of the Draft *Shoreline Analysis Report for Shorelines in Grays Harbor County* to help effectively manage these uses.

For all uses, including water dependent uses, the shoreline master program update should recognize the hazards inherent in a shoreline location, such as geological hazards, channel migration zones, and tsunamis. The shoreline master program update should include standards to protect people and property from these natural hazards and to ensure if a disaster strikes adverse impacts on the environment and other uses are avoided.

We support the development of a restoration plan to generate a net improvement in shoreline resources. A well done restoration plan can assist developments that may impact shoreline resources in ways that cannot be avoided by providing restoration opportunities the proposed development can carryout to offset these impacts.

Again, thank you for the opportunity to comment on Grays Harbor County's Shoreline Inventory, Analysis and Characterization Report, and we look forward to continuing to work with the County on the Shoreline Master Program process has it goes forward.

Sincerely,

Received from Casey Dennehy, Surfrider Foundation

Memorandum

November 13, 2014

TO: Kevin Varness, Grays Harbor County
John Kliem, Creative Community Solutions

FROM: Kim Van Zwalenburg, Department of Ecology
Rick Mraz, Department of Ecology

SUBJECT: Draft Shoreline Analysis Report dated August 2014- Ecology follow up comments

As promised, these comments are a follow up to our review of the most recent Shoreline Analysis Report (SAR). We were particularly looking at how our comments on the preliminary draft have been incorporated into the August 2014 draft. Additionally, we met with The Watershed Company on October 15, 2014 to discuss the concerns of Washington Department of Fish and Wildlife (WDFW).

We would like to acknowledge that the revised document does incorporate many of our previous comments.

Channel Migration Zones: Thank you for the added discussion within the text of the document. It is apparent there is some information related to channel migration that has been identified. The WAC requires that these be generally mapped. Absent more detailed studies, this initial mapping is just meant to show the locations of potential (or known) channel migration, nothing more.

Regarding the functional scoring methodology, the following comments remain an issue and we would like some resolution to address our concerns.

- Please identify and explain the science that informs the break points for these functions. For example, why is a 40% forested floodplain considered low function? Why are some of the break points unequal? What functional score is assigned to a value of 5% area in a floodplain (1 or 2)?

- Similar to the question above, why is 40% cover considered low function? Per Cowardin, 30% cover is sufficient to establish a veg. class as present and influencing ecosystem process. Again, why are the breaks unequal?

- Assessing only tree/forest cover is problematic for wetlands along the outer coast and may undervalue them. These wetlands are younger and typically only contain PEM or PSS vegetation classes. This aspect does not devalue these wetlands in this landscape context, as they are the dominant wetland types and their habitat elements are well utilized by wetland-associated species. How will this ecosystem value be represented and normalized?

While we can't speak directly for WDFW, it is our understanding that the following aspects of the analysis remain significant concerns for the agency:

- Using PHS occurrence is problematic as that dataset represents vastly different scales and indications of available habitat. For example, it is possible for an area to only contain one type of Priority Habitat (i.e. Nearshore – Open Coast, which would apply to all of the outer coast of Grays Harbor) but still represent an enormous area and ecosystem process. Another area may contain a snag or log, which is a small, discrete habitat element and, in no way comparable to a landscape-scale feature. As such, individual occurrences of priority habitat are not scalable or comparable in a numeric sense. This representation should be removed.

- Citing fish passage barriers is equally problematic since the dataset does not distinguish how many river miles are affected by the blockage, and blockages may be partial.

Please contact us with any questions you may have about these comments.

cc: Dan Nickel, The Watershed Company
Gloria Rogers, Washington Department of Fish and Wildlife
Theresa Nation, Washington Department of Fish and Wildlife